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METALS and ALLOYS

The Magazine of Metallurgical Engineering

PRODUCTION • FABRICATION • TREATMENT • APPLICATION

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CLEVELAND GRAPHITE BRONZE produces *Four Times* as many bearings with...

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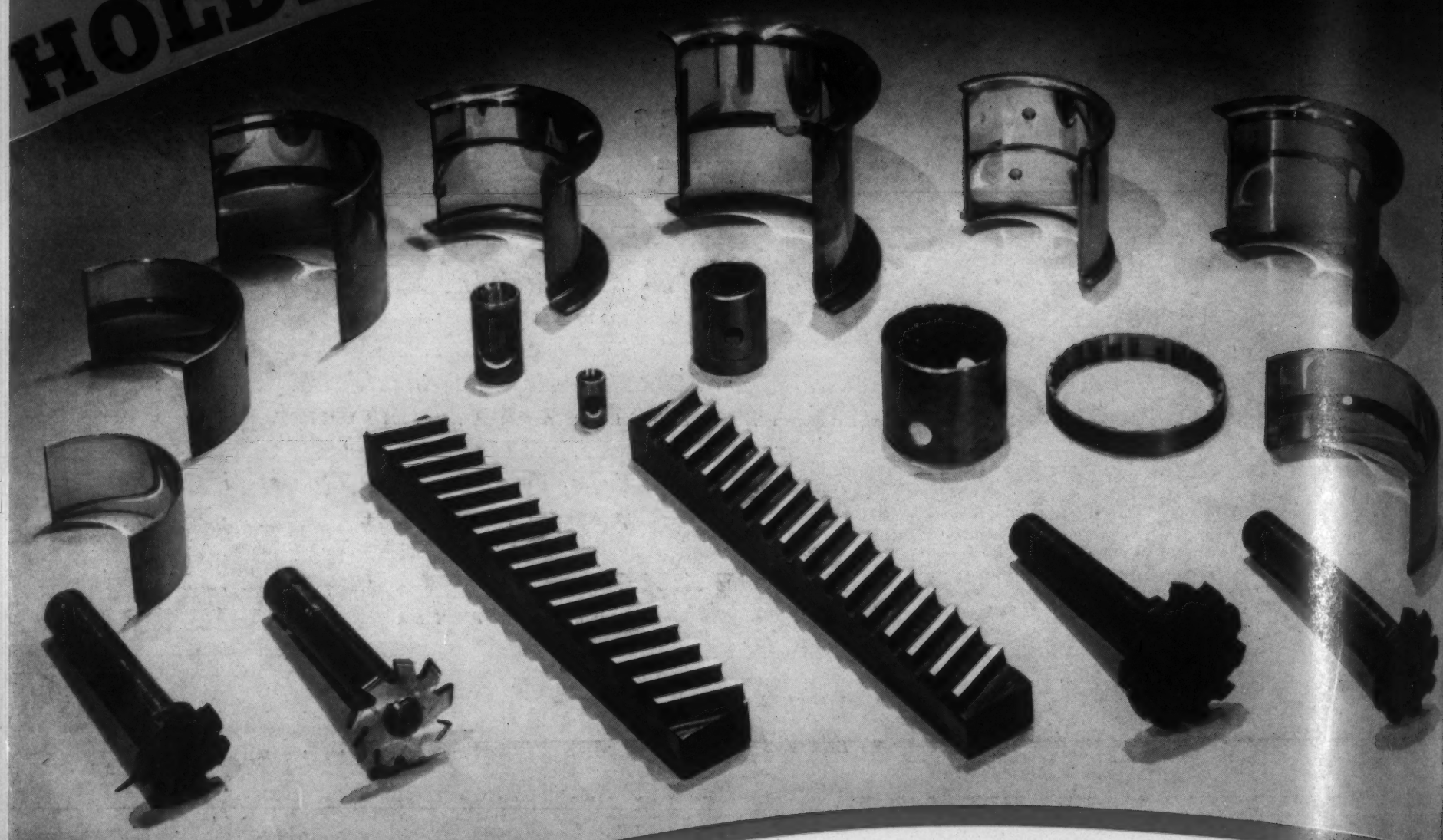

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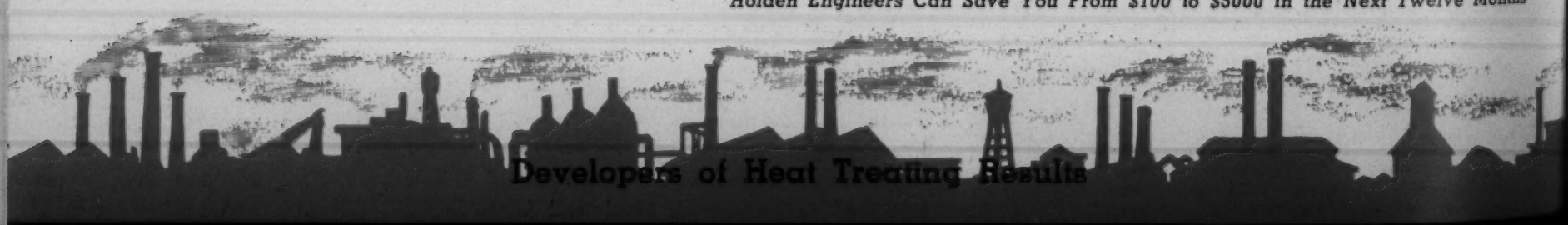

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Highlights

WRITTEN BY THE ABSTRACT SECTION EDITORS AND THE EDITORIAL STAFF

Do you want to know what metallurgical engineers are saying, the world over? Look in the Current Metallurgical Abstracts. Here are some of the points covered by authors whose articles are abstracted in this issue.

Widespread Corrosion Work

Corrosion studies are no longer confined to bare steel. The British Committee is paying considerable attention to painted steel (page MA 511L1), which seems intelligent, since that's the way it is used, and the topic is also discussed by a Swedish author (page MA 496R6). In Holland the Soil Corrosion Committee doesn't find tar much good as protection on burned pipe lines (page MA 510R1). An Australian writer has something to say about this, too (page MA 496R5). These cooperative projects are respectively along the lines of the A.S.T.M. and the Bureau of Standards long-time studies. The results so far appear corroborative of the American findings. Certainly corrosion is a problem of world-wide interest.—H.W.G.

Tests and Service

We are often told that language was given us so that we can conceal our thoughts. Something of the same point of view is raised as to whether standard tests for metals reveal service abilities, in articles by Clapp (page MA 498L7), Inglis (page MA 498R5) and Siebel (page MA 498L10), representing the U. S., England, and Germany, as well as in one on deep-drawing by Andrieu (page MA 498R1). All agree that the time is not yet when engineering common sense in choice and interpretation of tests can be dispensed with. —H.W.G.

Cutting Tool Testing

Woxen (page MA 482R9) claims to have found a way to simplify and cheapen tool-life tests.—H.W.G.

Effect of Flame Cutting on Boiler Plate

The results of the tests of specimens flame cut from boiler plate (page MA 491L1) correspond with those of similar investigations conducted in this country. Physical properties, such as hardness, microstructure, resistance to impact, and ductility, of flame cut edges of low and medium carbon steel, have been found satisfactory for almost any type or character of mechanical treatment or service. Both shearing and friction sawing have been shown to inflict more punishment on the surface of the metal than flame cutting.

The A.S.M.E. Boiler Code Committee recently removed practically all restrictions in the Boiler Code pertaining to welding on surfaces prepared by gas cutting. The rules now state that boiler plates may be cut to size and shape by a flame cutting process, provided the carbon content of the steel does not exceed 0.35 per cent. However, such flame cut plate edges must be uniform and smooth and all loose scale and slag accumulations must be removed from them before welding. The discoloration which may appear on gas cut surfaces is not considered to be detrimental oxidation. When flame cut edges are welded, the heat of the welding operation acts to anneal the cut surfaces and restore them to their original pearlitic structure.—E.V.D.

Aluminum Screw Stock

Free-cutting Al and Mg alloys are being given a lot of attention, especially abroad, judging from the number of articles on the subject (pages MA 482R1, R2, R3, R4, R5 and R7; MA505L6 and L7).—H.W.G.

New Steels

Heaven knows the list of S.A.E. steels is plenty long. But just as Burbank and those who followed in his footsteps kept on improving flowers and fruits, so the metallurgists keep putting the elements together in a little different way, to produce results that seem odd till we get used to them. Fuchs (page MA 514R5) discusses a Cr-Mn to compete with stainless, Bonte (page MA 514L2 and L3) graphitic steel; boron steels are mentioned (page MA 514R3) and Berchtenbreiter (page MA 514R1) speaks of vanadium rail steel. Metallurgically, V rail steel sounds o.k., but what would the extra be on a rail with ⅓% V, and how would you like to be a salesman trying to sell a rail so priced to the U. S. railways?—H.W.G.

Pipe Coatings

Bredberg (page MA 509R2) discusses cementing a rubber wrapping about buried pipes to prevent corrosion. The last time we highlighted an article on this sort of thing we remarked that most everything but cellophane had been tried, and were promptly informed that it *had* been tried. So now we'll say everything but second-hand chewing gum.—H.W.G.

Hydrogen Again!

Yajima (page MA 500L6) discusses the relation of hydrogen to flakes in steel ingots and forgings; Boyles (page MA 500L2) its relation to size of graphite flakes in cast iron. Miyashita (euphonious name!) ascribes the formation of flaky graphite in cast iron to presence of nitrogen above 0.002%, fine graphite being formed at lower nitrogen contents (page MA 500L5). —H.W.G.

Thermal Reduction of Alumina

Härter (page MA 474R3) recounts some previously known facts, such as that an alloy of the Alsifer type can be made thermally, but he springs a new one, too. He claims the formation of a compound $Al\text{-}Al_2O_4\text{-}Al_4C_3$. Now let's postulate that this is the grain-control agent in Al-treated steels and satisfy everybody whether they ascribe control to metal, oxide, or carbide. —H.W.G.

They Don't Check

Rodiek (page MA 513L2) says you can't use Al for water pipes because of electrolytic attack where it joins on steel pipe. Schemel and Clodius (page MA 513L8) say Al wool is o.k. for joint packing. No electrolytic attack.—H.W.G.

Controlled Atmospheres

Hotchkiss (page MA 483L2) discusses the effect of water vapor in controlled atmospheres and describes a useful dew point apparatus for determination of its amount. If this were more widely in use and more checks were made on moisture in entrance and exit gas lots of controlled atmosphere difficulties wouldn't seem so mysterious.—H.W.G.

Welding Copper and Its Alloys

This excellent review (page MA 491L3) represents a part of the work now being carried on by the Welding Research Committee, sponsored by the American Society of Electrical Engineers and the American Welding Society, under the auspices of the Engineering Foundation.

The plan of the review is a very logical one. The first part gives a brief description of the properties of pure copper and copper as affected by other elements. This is essential to obtain a proper understanding of the correct procedures and difficulties encountered in the welding of copper. Properties of vital interest in welding are considered specially. Some of these are: (a) melting point; (b) affinity for oxygen; (c) relative solubility of oxide; (d) melting point of oxide; (e) comparative density of oxide; (f) surface tension of molten metal; (g) ductility at all temperatures; (h) coefficient of thermal expansion; (i) thermal conductivity; (j) effect of time on welding reactions.

In the next six parts of the review, copper and its alloys are classified into groups, the welding characteristics of which are somewhat similar. This arrangement facilitates finding information on the welding of any particular commercial copper alloy. The several different methods of welding are arranged as sub-divisions of these groups.

Chief considerations in welding are shown to be: (a) chemical, metallurgical and physical properties of base metal; (b) selection of heat source; (c) preparation of edges and set-up for welding; (d) selection of welding rod; (e) selection of flux, if any; (f) actual welding procedure; (g) after-treatment; (h) testing of weld.

The last part deals with special welding processes involving copper alloys. The conclusion shows how knowledge of the art of welding copper and its alloys may be added to by further researches, properly planned so as not to duplicate work already done.—E.V.D.

SIGNS OF THE TIMES

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3-2

YOUNGSTOWN

EDITORIAL

The Lightning Rod

The young technical graduate has been thankful to get and hold any job during the last few years, but the demand now seems to have caught up with the supply. There are vacant places on the lower rungs of the ladder and even some unoccupied ones further up. If there is a further breathing spell before the next depression, the problem will arise to many a youngster whether he is in the organization he wants to stay in for life or whether it isn't time to shift. Now and then a man and an organization fit together so well that no shift occurs, but about 99 44/100% of technical men make one or more moves in the course of their career.

It is a whole lot nicer for a man to be invited to another job than for him to get disgruntled and be "looking for a change." If an employer has his eye on promising timber that he has watched grow and of whose fiber he has a long-developed impression, he will unconsciously see an opening and tend to fill it long before his need is so pressing that he must comb his files for applicants personally unknown to him.

Moreover, the most potent way to open the eyes of a present employer to the fact that one of his youngsters has passed the diaper stage is to have that youngster invited to step to a higher rung in another group.

So the youngster might well put up a lighting rod that will draw the attention of people in other organizations without creating the impression that he is disloyal and dissatisfied. Such a problem, which in a way is one of personal advertising, is not easy to solve, the solution often depending primarily on chance. Yet the situation is seldom wholly beyond some degree of control. The problem sifts down to his getting into personal contact with older men of other organizations and so comporting himself that they respect his ability, common sense, and breadth of vision, and admire his personality. They must be made to feel that he can go beyond the confines of his present tasks, and to give that feeling he must keep abreast of progress in a broad field, which means reading, study, and discussion with others on matters well outside of his present niche.

But no matter how good the man may be, others have to rub elbows with him before they appreciate it. He may not be able to horn into the golf club frequented by those he'd like to meet, but without any offense, indeed with a warm welcome, he can join some of the technical societies to which they belong and whose meetings they attend. If the society has a local section, he can get to know the local men unless he merely sits in like a bump on a log and takes no part at all. To use regional and national meetings for contact purposes, the youngster must be willing to use his own vacation time and pay his own expenses for a while, and getting into real touch with older, busy men at such meetings is neither very easy nor very effective. A more effective way is to seek out a committee in which the older men are interested and see if it hasn't some drudgery to be done. Most of them have, and the secretary of the society will ordinarily be delighted to connive with an aspiring youngster looking for an opportunity of this sort, asking only to help and to learn, not for official membership on the committee. The committee meetings would become open to him, and the more intimate contacts thus made are the type that is most useful.

After all, one joins a technical society for its usefulness in his career, and it can be useful in other than technical ways. If one is willing to work and do it modestly, even though he does it chiefly for a self-seeking purpose, such work may be well rewarded in the long run.—H. W. G.

Manganese Ore

Only a minor part of the domestic requirements of the American steel industry for managanese ore of at least the metallurgical grade was supplied by domestic producers, according to the advance summary of the U. S. Bureau of Mines.

Domestic production of manganese ore (35 per cent or more of Mn) was 32,119 gross tons last year. This is an increase of about 22 per cent over the 26,428 tons shipped in 1935. But, according to the same report, manganese ore imported in 1936 totaled 846,648 gross tons, or an increase of about 121 per cent over the 383,500 tons imported in 1935.

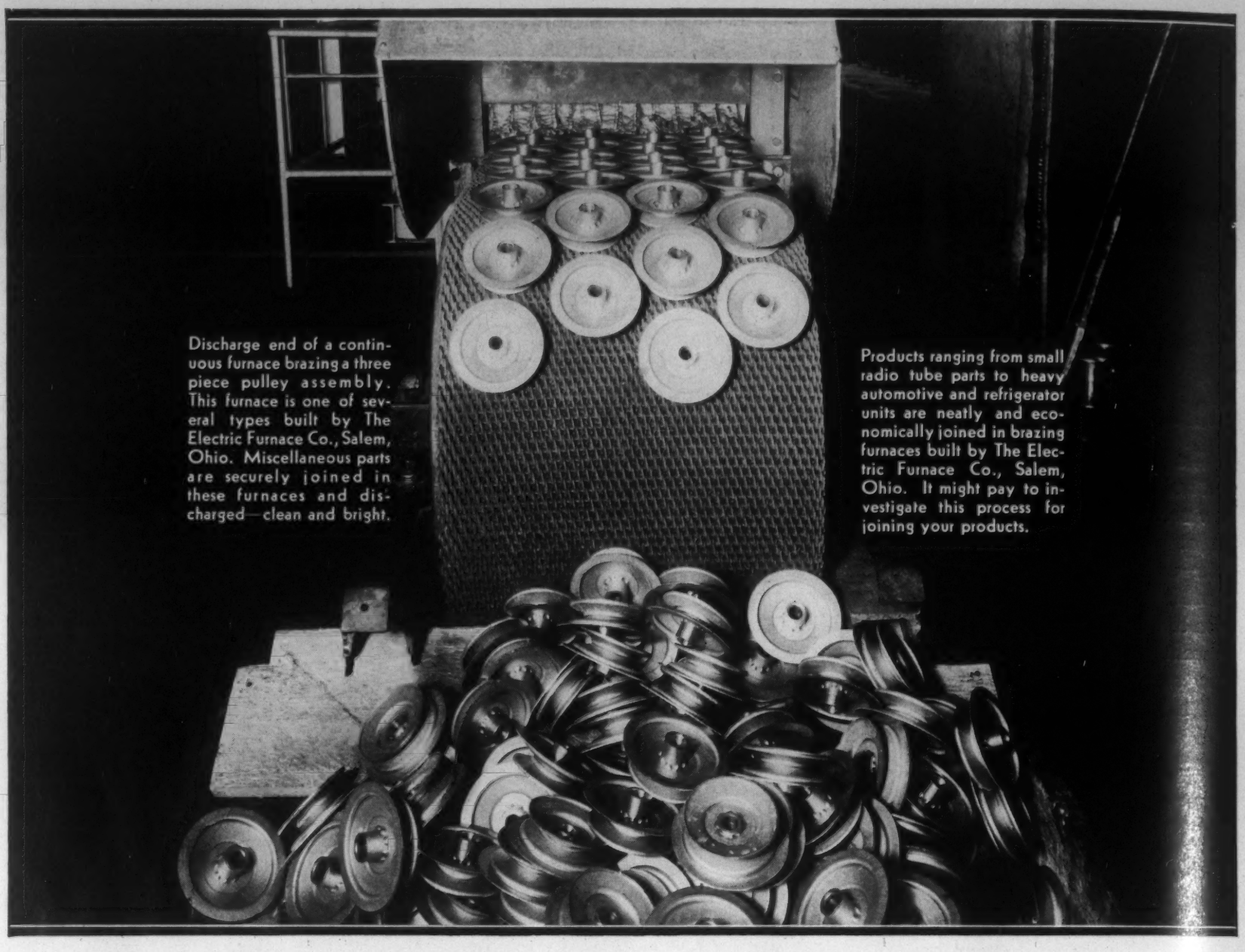
If the total imports and the domestic shipments for 1936 are taken as the total consumption, or 878,767 tons, then the amount furnished by American mines is only about 3.6 per cent of the total.

And yet we hear often of protection for the American industry and the large resources in American mines. —E. F.C.

Research

A huge and imposing new structure, or temple of science, for Mellon Institute in Pittsburgh was recently dedicated—the gift of the Mellon brothers who founded the institution in 1911. Its dedication has been designated as an event of national magnitude, and this is rightly so characterized. For in the 26 years since its founding, Mellon Institute has served 4000 firms, developed 650 processes and products in many fields, and created ten new industries. The new building, impressive in its architecture and beauty, is a monument to the generosity and far-sightedness of the two brothers but also to the late Professor Robert K. Duncan who conceived the industrial research fellowship system—one of pronounced success.

Such an institution, and there are others, is a great aid to industry, particularly to the small company which is unable to afford the large research department which a large company can. In such institutions, for a few thousand dollars, science doffs its coat and gives even more than value received, demonstrating the rich return that comes from research.—E. F. C.



Discharge end of a continuous furnace brazing a three piece pulley assembly. This furnace is one of several types built by The Electric Furnace Co., Salem, Ohio. Miscellaneous parts are securely joined in these furnaces and discharged—clean and bright.

Products ranging from small radio tube parts to heavy automotive and refrigerator units are neatly and economically joined in brazing furnaces built by The Electric Furnace Co., Salem, Ohio. It might pay to investigate this process for joining your products.

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—by the continuous copper brazing furnace method

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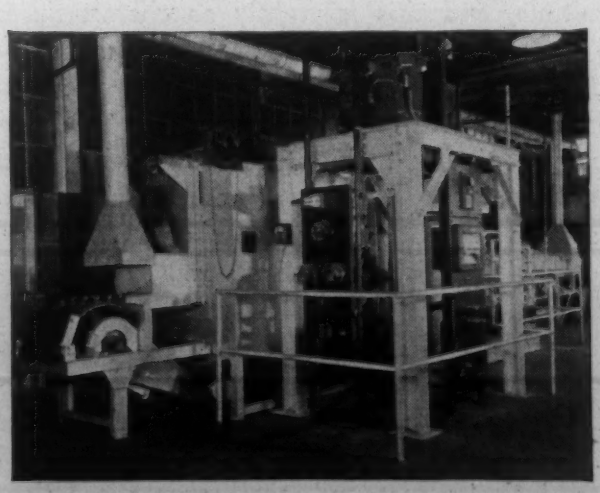

Charging end of a continuous brazing furnace showing automatic controls and generator for producing the inexpensive protective atmosphere used in this equipment.

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CURRENT Metallurgical Abstracts

A DIGEST OF THE IMPORTANT METALLURGICAL DEVELOPMENTS OF THE WORLD

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CLASSIFICATIONS

1. ORE CONCENTRATION

Crushing, Grinding & Plant Handling (1a), Gravity Concentration (1b), Flotation (1c), Magnetic Separation (1d), Amalgamation, Cyanidation & Leaching (1e).

2. ORE REDUCTION

Non-Ferrous (2a), Ferrous (2b).

3. MELTING, REFINING AND CASTING

Non-Ferrous (3a,) Ferrous (3b).

4. WORKING

Rolling (4a), Forging & Extruding (4b), Cold Working, including Shearing, Punching Drawing & Stamping (4c), Machining (4d).

5. HEAT TREATMENT

Annealing (5a), Hardening, Quenching & Drawing (5b), Aging (5c), Malleableizing (5d), Carburizing (5e), Nitriding (5f).

6. FURNACES, REFRACTORIES AND FUELS

7. JOINING

Soldering & Brazing (7a), Welding & Cutting (7b), Riveting (7c).

8. FINISHING

Pickling (8a), Cleaning, including Sand Blasting (8b), Polishing & Grinding (8c), Electroplating (8d), Metallic Coatings other than Electroplating (8e), Non-Metallic Coatings (8f).

9. TESTING

Inspection & Defects, including X-Ray Inspection (9a), Physical & Mechanical Testing (9b), Fatigue Testing (9c), Magnetic Testing (9d), Spectrography (9e).

10. METALLOGRAPHY

11. PROPERTIES OF METALS AND ALLOYS

Non-Ferrous (11a), Ferrous (11b).

12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

13. CORROSION AND WEAR

14. APPLICATION OF METALS AND ALLOYS

Non-Ferrous (14a), Ferrous (14b).

15. GENERAL

Economic (15a), Historical (15b).

1. ORE CONCENTRATION

JOHN ATTWOOD, SECTION EDITOR

Bulk Sampling. R. M. P. HAMILTON & W. H. EMENS. *Can. Mining J.*, Vol. 58, Apr. 1937, pp. 175-176. The Kerr-Addison bulk sampling plant is illustrated and briefly described. WHB (1)

Studies of Concentration of Kounrad Copper Ores. G. P. UNGER. *Tzvetnve Metal*, No. 8, Sept. 1935, pp. 44-66. In Russian. Detailed review of the work of the Russian State Institute of Non-ferrous Metals on concentration of Cu ores of the Kounrad deposits (Russia). BND (1)

A Revival of Lead Mining at Halkyn, North Wales. J. B. RICHARDSON. *Bull Inst. Mining Met.*, No. 389, Feb. 1937, pp. 35-40; No. 390, Mar. 1937, pp. 27-34. Discussion. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 338L/2. AHE (1)

Progress Report No. 3 on Investigation of Detachable Rock-drill Bits. MCHENRY MOSIER. *U. S. Bur. Mines, Information Circ.*, No. 6936, Apr. 1937, 27 pp. Practice, experience in use, and costs of detachable rock-drill bits at 10 mines are described. Savings in costs by their use are 10-40%, exclusive of reduced labor costs. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 338L/4. AHE (1)

1a. Crushing, Grinding & Plant Handling

Comparison of Low Versus High Discharge Ball Mills. E. L. LONGMORE & HOLLINGER MILL STAFF. *Bull. Inst. Mining Met.*, No. 390, Mar. 1937, pp. 1-16. Discussion. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 338R/9. AHE (1a)

1c. Flotation

Molybdenum Operations at Climax. WILLIAM J. COULTER (Climax Moly. Co.) *Mining Congr. J.*, Vol. 23, Jan. 1937, pp. 54-56. Ore reserves are in excess of 100,000,000 tons, averaging about 0.80% Mo. The ore is concentrated in a flotation plant with a daily capacity of 10,000 tons. A concentrate with 90% MoS_2 is produced, with a mill recovery of about 90%. The concentrate is shipped with 4% moisture to Langeloth, Pa., where it is converted into calcium molybdate or ferro-molybdenum. Reviews briefly the most important uses of Mo, in alloy steels, cast Fe, and vacuum tubes. Many salts are also used, in dyes, pigments, ceramics, rubber, and leather production. BHS (1c)

The Application and Functions of Chemical Reagents in Flotation. R. D. NEVETT. *Proc. Australasian Inst. Mining & Met.*, No. 102, June 30, 1936, pp. 89-154. Reagents for depressing, activating, and frothing are listed and laboratory data for use of each on various minerals and ores are given. Discussion (45 pp.) adds data of many other investigators. AHE (1c)

A Review of Recent Flotation Patents. IVOR BASSETT. *Can. Mining J.*, Vol. 58, Apr. 1937, pp. 185-187. WHB (1c)

1e. Amalgamation, Cyanidation & Leaching

The Achotla Chloridizing Mill. H. P. ALLEN. (Cia. Minera de Peñoles, S. A.) *Mining Tech.*, Vol. 1, Feb. 1937, T.P. 773, 13 pp. Describes mill and process at Temisco, Gro., Mexico. Mill is one of few still using Cl process. Ore consists of Ag and Au that cannot be extracted by a simple cyanide treatment. JLG (1e)

The Oxygen Content of Cyanide Solutions. F. J. TROMP & W. E. SCHILZ. *J. of the Chem. Met. Mining Soc. S. Africa*, Vol. 36, Sept. 1936, pp. 55-56. Discussion. See *Metals and Alloys*, Vol. 6, Nov. 1935, p. MA 434L/7. AHE (1e)

Some of the Factors which Influence the Rate of Dissolution of Gold and Silver in Cyanide Solution. E. BEYERS. *J. Chem. Met. Mining Soc. S. Africa*, Vol. 37, Oct. 1936, pp. 148-152. Discussion. See *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 201L/4. AHE (1e)

2. ORE REDUCTION

A. H. EMERY, SECTION EDITOR

2a. Non-Ferrous

Investigations of the Production of Aluminum by Thermal Methods (Untersuchungen über die Gewinnung von Aluminium auf thermischem Wege) HERMANN HÄRTER. Doctor's dissertation, Technische Hochschule Aachen, 1936, 79 pp. Reduction of Al_2O_3 with C did not produce satisfactory Al because: (1) The reduction temperature of Al_2O_3 lies near or above the boiling point of Al; (2) formation of carbides takes place; (3) a ternary compound, $Al\text{-}Al_2O_3\text{-}Al_4C_3$, exists in the reduction range of Al_2O_3. The reduction of Al_2O_3 is possible in the presence of Fe_2O_3, and gives a ferro-aluminum. A natural bauxite, to which is added Fe_2O_3, gives a ferro-aluminum containing C and some Si. Reduction of SiO_2 by C gives SiC, and, in the presence of Fe or Fe_2O_3, ferro-silicon. A mixture of Al_2O_3 and SiO_2 is reduced to a Si-Al containing C. A synthetic mixture of Al_2O_3, SiO_2 and Fe_2O_3, reduced with C, gives an Al-Fe-Si alloy containing C. This charge can be varied over quite wide ranges. The recovery of Al, Si and of total metals increases with increasing Fe content, and the C content decreases as Fe is increased. The tests were carried out in an electrical resistance furnace, but they were reproduced in an electric arc furnace and in an electric shaft furnace. It was possible to get less than 1% C in the metal by addition of CaO in the charge, to form CaC_2, and by using the proper type of furnace and furnace lining, but the recovery of Al dropped with the lower C content. Reduction of a natural clay with hematite added under the conditions outlined also proved feasible. BHS (2a)

Influence of Moisture on Current Efficiency in Electrolysis of Carnallite. Z. V. VASILEV. *Legkie Metal.*, Vol. 5, Aug.-Sept. 1936, pp. 35-40. In Russian. Original research. Increasing H_2O content in electrolyte from 0 to 0.5% decreases efficiency from 95% to 30%. HWR (2a)

The Influence of Current Density and Distance Between Electrodes on Current Efficiency of the Hall Cell. G. A. ABRAMOV (Leningrad Ind. Inst.). *Legkie Metal.*, Vol. 5, Aug.-Sept. 1936, pp. 19-35. In Russian. Original research. The current efficiency equals $K^{\frac{1}{Dl}}$ where D is the current density in amp./cm.^{2} and l is the distance between electrodes in cm. For Al electrolysis K = 0.50. See *Metals and Alloys*, Vol. 8, May 1937, p. MA 266R/6. HWR (2a)

2b. Ferrous

Studies on Carbon Deposition During Reduction of Iron Ores (Några Studier Rörande Kolutfallning vid Reduktion av Järnmalmer) BO KALLING & JOHN STALHED. *Jernkontorets Ann.*, Vol. 121, Jan. 1937, pp. 30-43. CO was passed over Fe ores in a rotating furnace at temperatures of 200 to 800° C. Measurement of the inlet and outlet gas volumes indicated whether the CO reacted with the ore or was cracked into C and CO_2. Magnetite and wüstite were without catalytic influence on C deposition from CO. Pure C from sugar also had no effect, but wood charcoal had a very slight catalytic action. Pure electrolytic Fe plate had a marked catalytic action. The C was deposited in a fluffy, soot-like mass and the plate lost weight, but the loss appeared distributed throughout the deposited C. HCD (2b)

Some Experiments on the "Direct" Reduction of Titaniferous Iron Ores. R. P. FORSYTH. *J. Chem. Met. Mining Soc. S. Africa*, Vol. 37, Oct. 1936, pp. 132-148. Titaniferous magnetite is unsuited for blast furnace smelting owing to (a) the higher temperature and longer time to reduce magnetite and (b) formation of infusible compounds of Ti in the hearth of the blast furnace. The literature on direct reduction is reviewed and theoretical considerations discussed. A series of 11 preliminary experiments are described. Fe recovery was about 95%; Fe in the concentrate 65-90%. Slags are pasty at 1100-1350°; no trouble should be experienced due to infusible Ti cyanides or nitrides unless the temperature exceeds 1400°. Fuel used was almost the theoretical amount; gases leaving the charge at 1100-1400° contain 70-75% CO. S in the metallic concentrate is high (0.3-0.51%) making it unsuitable for steel making. AHE (2b)

3. MELTING, REFINING AND CASTING

G. L. CRAIG, SECTION EDITOR

The Use and Care of Crucibles. H. N. BASSETT. *Foundry Trade Journal,* Vol. 55, Oct. 29, 1936, pages 339, 340. Warm, dry storage conditions are important. Drying time, the first heat, preheating, fluxing, furnace tools, furnace condition and choice of fuel are discussed. All fluxes of a basic character attack the material of which crucibles are made to a varying degree. So far as possible, fluxes should be avoided and charcoal used only as a cover. AIK (3)

The German Foundry Exhibition. *Engineer,* Vol. 162, Nov. 6, 1936, pages 483-486. **The Düsseldorf Foundry Exhibition.** *Engineering,* Vol. 142, Dec. 11, 1936, pages 637-640. Illustrated articles describing the Sixth German Foundry Exhibition held Sept. 17 to 27, 1936. Among exhibits described are machines for cleaning and dressing castings, pressure die-casting machines, sand sifters and throwers, molding machines, core-making facilities, melting furnaces, a grinding machine and laboratory equipment. LFM (3)

Evolution and Development of Steel Making Processes. J. T. WRIGHT. *Proc. Staffordshire Iron Steel Inst.,* 1935-36, Vol. 51, pp. 1-21. A presidential address, giving, in condensed form, an historical review of data on steel making processes. GTM (3)

The German Foundry Exhibition. A. J. GIBBS SMITH. *Indian & Eastern Eng.,* Vol. 79, Dec. 1936, pp. 592-595. General survey of the 6th German Foundry Exhibition held in Düsseldorf during Sept. 1936, showing the extent to which the mechanization of the foundry has been carried out in Germany. APS (3)

Electric Radiation Melting Furnace of the George Type (Elektrische Stralings Smeltoven systeem-George) TH. ROSSKOPF. *De Ingenieur,* Vol. 51, July 31, 1936, pp. E94-E96. Descriptive, with operating data. See *Metals and Alloys,* Vol. 7, Apr. 1936, p. MA 190L/4. Ha (3)

Pattern Painting by Spraying (Modellanstrich mittels des Spritzverfahrens) O. TH. KORITNIG. *Giesserei,* Vol. 24, Jan. 29, 1937, pp. 59-61. Describes an arrangement for spraying nitrocellulose lacquers. Ha (3)

Some Observations on Foundry Sands (Quelques Réflexions sur les Sables) GROSS. *Rev. Fonderie Moderne,* Vol. 31, Mar. 25, 1937, pp. 96-99. Review. Properties sand must possess to be suitable for molding purposes are discussed in general, and correct molding methods described. Ha (3)

Molding Large Angle Ring Castings. J. H. EASTHAM. *Mech. World Eng. Record,* Vol. 101, Apr. 23, 1937, pp. 413-414. Detailed description of molding 2600-lb. casting "without all the facilities which might conceivably be used to make the job an easy one." EF (3)

Electric Melting Furnaces (Les Fours Électriques de Fusion) MARCEL FOURMENT. *Bull. Assoc. Tech. Fonderie,* Vol. 10, Nov. 1936, pp. 403-412. Resistance, induction, and arc furnaces described and advantages and disadvantages discussed. See *Metals and Alloys,* Vol. 8, June 1937, p. MA 341R/6. WHS (3)

A Resumé of Metallizing Foundry Technique. W. C. REID (Metallizing Eng. Co.). *Metallizer,* Vol. 5, Dec.-Jan. 1937, pp. 2-3. Review of practical experience. Metallizing equipment has been found to be very useful in spraying sand cores and molds and in repairing defective castings. A number of case histories are cited to indicate the advantages and savings available with metal spray equipment in the foundry. Metallizing is useful in maintenance of equipment as well as being a valuable salvage tool. BWG (3)

A Study of Core Hardness. H. W. DIETERT & EARL WOODLIFF (Harry W. Dietert Co.). *Am. Foundrymen's Assoc.,* Preprint 37-12, 1937, 14 pp. A scratch test for hardness is suggested as a method for evaluating the quality of a baked core for use in a mold. A standard test procedure is outlined. The results are given of an investigation of hardness as related to variations in baking time and temperatures, moisture, cooling time, sand to oil ratio, and grain size. CMS (3)

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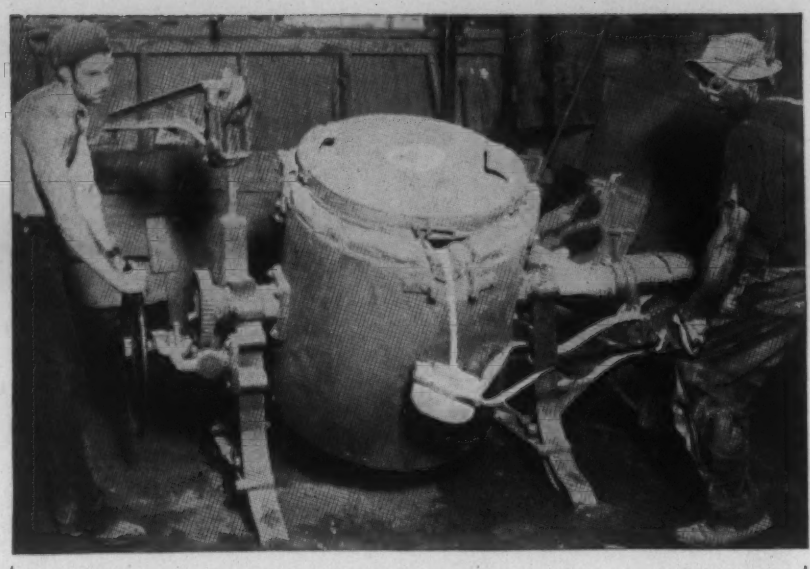

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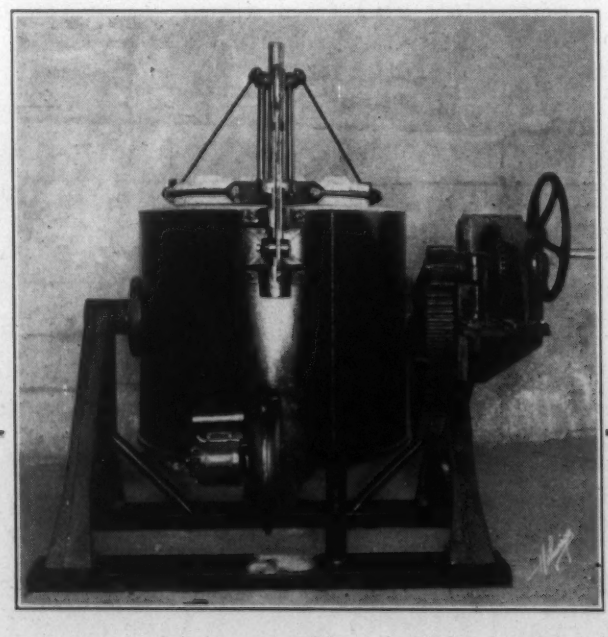

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3a. Non-Ferrous

1 **Platinum Group Metals.** R. H. ATKINSON & A. R. RAPER. *Chem. Trade J.*, Vol. 99, Sept. 18, 1936, p. 233. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 103L/6. MS (3a)

— **Electrolytic Aluminium Refining.** *Chem. Trade J.*, Vol. 99, July 31, 1936, p. 94. Note describing process which produces high-purity Al possessing superior electrical conductivity and corrosion resisting properties. See *Metals and Alloys*, Vol. 7, Sept. 1936, p. MA 440R/3. MS (3a)

2 **Castings and Forgings; Various Production Methods.** *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 52. Describes processes for Al alloys. MS (3a)

— **Influence of Drying and Baking on the Life of Zinc Distillation Retorts.** V. S. SOKOLOV & A. I. VARTAN'YAN. *Tsvetnye Metall.*, No. 10, Dec. 1935, pp. 31-39. In Russian. Original research, to determine best method of drying Zn distillation retorts made of
3 28.9% chamotte, 61.7% clays and 9.4% coke. (1) Drying can be accomplished in one mo. at temperatures gradually raised from 18° to 56° C. (2) Residual hygroscopic water allowable in retorts after drying without detriment to quality is 1% of original retort weight. (3) Baking should be done in a strongly reducing atmosphere at 950° C.; higher temperatures impair the quality of retorts.
— (4) In order to prolong the life of retorts the temperature of the furnace should not be allowed to rise above 1300° C. (5) Linear shrinkage in drying does not exceed 5%, and in baking 0.5%.
4 BND (3a)

— **X-ray as an Aid in the Manufacture of Aluminum Castings.** GEORGE E. STOLL & ARTHUR T. RUPPE (Bendix Products Corp.) *Am. Foundrymen's Assoc.*, Preprint 37-24, 1937, 14 pp. Practical. The use of the X-ray in connection with the development of casting practices for the production of an airplane carburetor is discussed. Fairly complete details are given for technique. The interpretation in the control of foundry procedure especially as it
5 relates to pinhole trouble is reviewed. It is concluded that the X-ray is of decided benefit in the manufacture of complicated Al castings as it is a reliable, nondestructive, and an economical inspection tool. CFJ (3a)

— **Foundry Technique of Copper Alloys (Technique en Fonderie d'Alliages Cuivreux)** M. DERDINGER. *Usine*, Vol. 46, Apr. 1, 1937, p. 31. Recommended practice for brass, bronze and nickel-
6 silver. Ha (3a)

3b. Ferrous

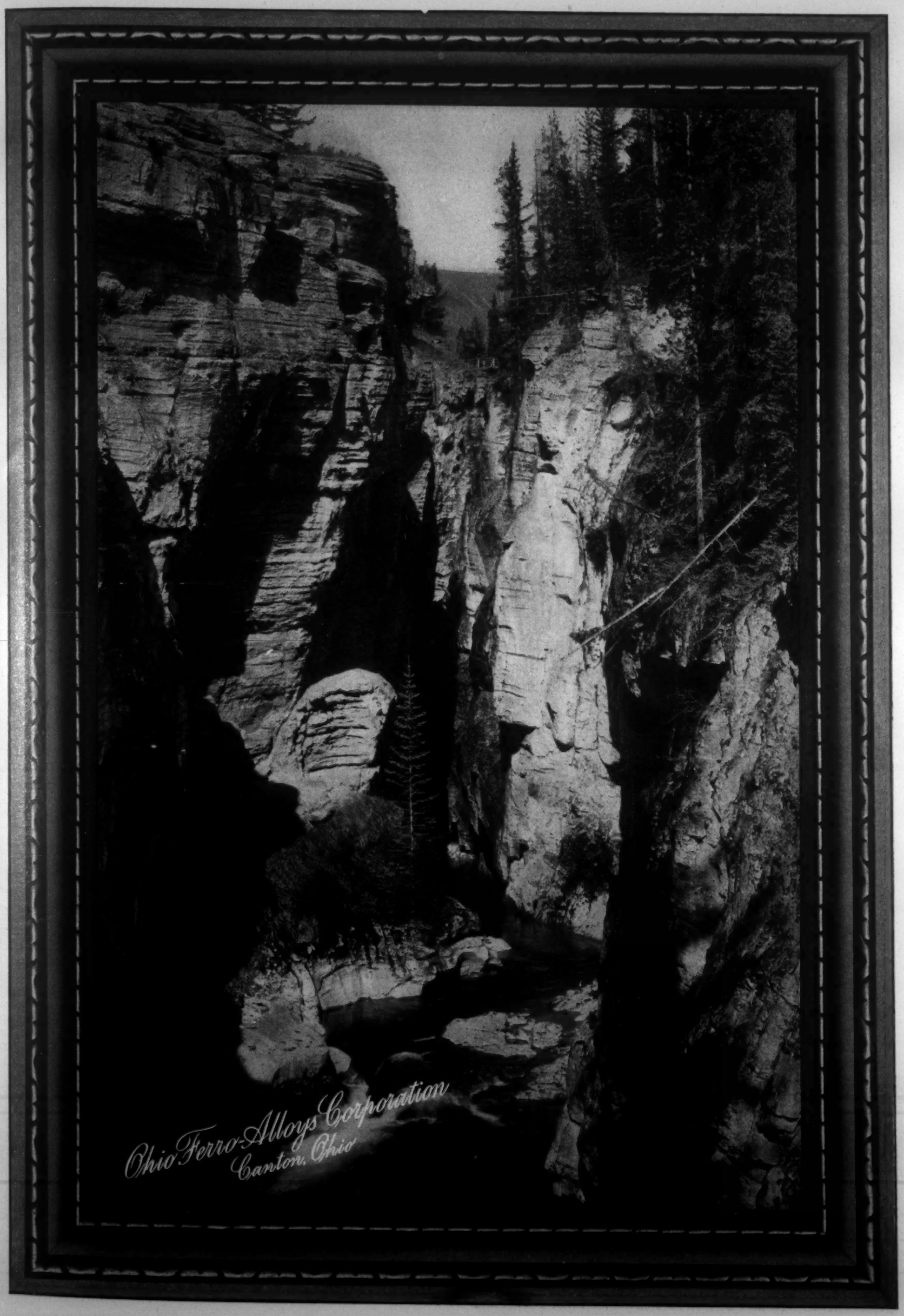
C. H. HERTY, SECTION EDITOR

7 **Molds Faced with Core Sand.** PAT DWYER. *Foundry*, Vol. 65, Jan. 1937, pp. 22-24, 76. Core sand is used extensively not only for the cores but also in many instances for facing mold either in whole or in part, at the Atlas Foundry, Detroit. Dried core sand presents a stiff face which prevents casting from swelling
— or straining, imparts a smooth face to Fe, simplifies making of mold and facilitates escape of gas. Shape, size and other general characteristics determine whether core sand is to be applied according to any one of 3 general methods, which are described. VSP (3b)

8 **The Diffusion of Gases through Metals. II.** C. J. SMITHELLS & C. E. RANSLEY. *Proc. Roy. Soc.*, Series A, Vol. 152, Nov. 15, 1935, pp. 706-713. It is found that H diffuses through Al at
— a measurable rate at temperatures above 400° C. The rate of diffusion depends on the state of the surface. The highest rate is obtained with a surface freshly scraped in H, but it falls off rapidly and after some hours reaches a steady value which is about 1/10 of the initial rate. This is attributed to contamination of
9 the surface by O, since this low rate is obtained with an anodically oxidized surface. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 166R/2. MAB (3b)

— **Gray Cast Iron.** JOHN W. BOLTON. *Foundry*, Vol. 65, Jan. 1937, pp. 46, 48, 51-52; Feb. pp. 46, 50, 52. Deals with the strength and elasticity of gray cast Fe. See *Metals and Alloys*, Vol. 7, May 1936, p. MA 260L/4. VSP (3b)

10 **Open-hearth Developments During 1936.** G. D. TRANTER. *Blast Furnace Steel Plant*, Vol. 25, Jan. 1937, pp. 71-73. Review of developments in combustion and temperature control, furnace design and construction, and metallurgy. MS (3b)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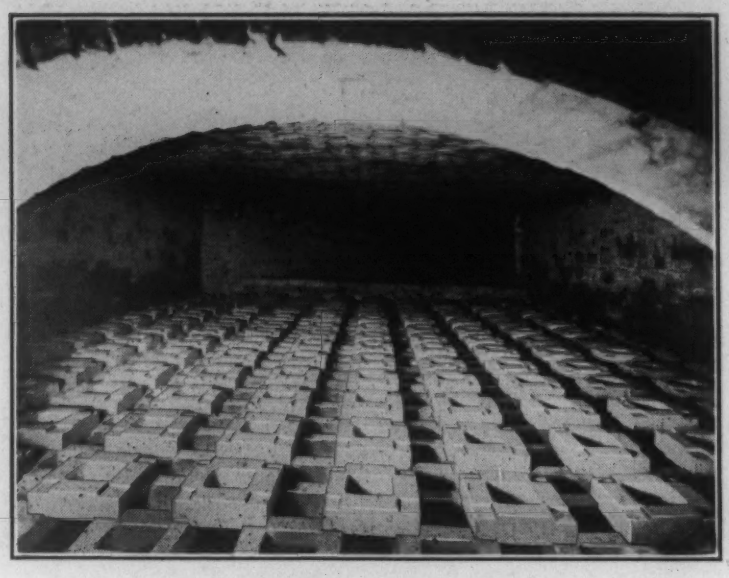

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Changes Method to Reduce Cost. J. H. EASTHAM. *Foundry,* Vol. 64, Dec. 1936, pp. 32-33, 84. Describes the casting of dock wall double bollard weighing 1700 lb. The order included 34 such castings, and after 4 were made by method requested by the customer, it was changed showing a saving of 330 hrs. for the remaining 30 castings. Gives details of procedure. VSP (3b)

1

Reputation Is Built on Accuracy of Castings. *Foundry,* Vol. 65, Jan. 1937, pp. 30-31, 72, 75. Describes the development of the Gale Mfg. Co., Albion, Mich., starting in 1853 for making castings for plows to the present time where a widely diversified line of light gray Fe castings are manufactured. VSP (3b)

—

Large Steel Castings Made in Germany. *Foundry,* Vol. 65, Jan. 1937, pp. 75-76. Describes 2 large steel castings, a lower and upper jaw for a hydraulic press made by Ruhrstahl A. G. Lower jaw weighed 131 tons, upper jaw 109 tons. To provide metal for runners and feeder 165 tons of metal were melted. Each casting remained in mold for 3 weeks. VSP (3b)

2

—

Steelmaking Progress. *Steel,* Vol. 100, Jan. 4, 1937, pp. 312, 314, 424-425, 445. Presents opinions of various authorities on developments during 1936 in manufacture of pig-Fe and melting and rolling of steel. MS (3b)

3

The Manufacture of Castings for Heavy Machinery. GEO. E. TAIT. *Iron & Steel Can.,* Vol. 19, Oct. 1936, pp. 9-16. General review of properties making cast Fe a desirable material for many fields, and discussion of the fields where it is preferable to use structural welds instead of castings. Methods of molding, pattern-making, composition of castings and their respective mechanical properties are described and tables and curves given. Melting in cupola, air furnace and electric furnace are discussed. Ha (3b)

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4

The Binary System, FeO-Al_2O_3. A. B. MCINTOSH & R. HAY. *J. Roy. Tech. Coll., Glasgow,* Vol. 4, Part 1, Jan. 1937, pp. 72-76. Original research. The diagram for the system FO-Al_2O_3 has been constructed from thermal data and 2 compounds have been identified on microscopical evidence and their formation satisfactorily explained by thermal evidence. The compositions $3.FeO.Al_2O_3$ and $FeO.Al_2O_3$ have provisionally been assigned to these compounds, chiefly on micrographical grounds, but further evidence is necessary before these compositions can be fully accepted. JWD (3b)

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5

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Foundry Methods for Producing Cast Iron for Porcelain Enameling. R. B. SCHAAL. *Foundry,* Vol. 64, Dec. 1936, pp. 28-29, 74, 77-78. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 204L/9. VSP (3b)

6

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Practical Observations on Making Synthetic Cast Iron in a Steel Foundry in a Heroult Furnace (Observations Pratiques sur l'Élaboration de Fontes Synthétiques au Four Héroult dans une Aciérie de Moulage) A. MAL. *J. Four Elec.,* Vol. 46, Feb. 1937, pp. 60-62. Log of a heat is given. JDG (3b)

—

Bed Used for Many Castings. JOHN D. BABBITT. *Foundry,* Vol. 65, Mar. 1937, pp. 26-27. Practical discussion of method of molding castings for a plate glass polishing unit used by the Willsea Works, Rochester, N. Y. VSP (3b)

7

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Melting of Cast Iron in the Foundry. S. E. DAWSON. *Foundry Trade J.,* Vol. 55, Nov. 19, 1936, pp. 393-396. Practical. The cupola, crucible furnace, rotary furnaces, preparation of linings, costs and metallurgical considerations are discussed. The balanced-blast cupola is specially designed to avoid as far as possible contact of the globules of liquid metal with oxidizing gases, which include carbon dioxide ($Fe + CO_2 \rightarrow FeO + CO$) as well as O, thus avoiding not only loss of Fe, etc., but also the formation of scouring slags detrimental to the lining. Reducing gases, with which the molten metal may be in contact, may react with the non-metallic inclusions to raise the freezing point and thus promote graphite growth. The rotary furnace is made in sizes of 1, 2, 3½, 5, 10 and 15 tons capacity. When exact precision in analysis is required, as, for example, in chill rolls, steels, wear-resisting castings, and alloy Fe, the metal can be held in the furnace while being sampled and analyzed prior to making final adjustments in composition. The character of burner employed depends on the type of fuel used. AIK (3b)

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Ferroalloys in the Foundry. JOHN N. LUDWIG, JR. *Foundry,* Vol. 65, Jan. 1937, pp. 32-33, 84, 87; *Steel,* Vol. 100, Mar. 8, 1937, pp. 40-41, 62, 64. Discusses the use of ferroalloys such as ferrosilicon, ferrochrome and ferromolybdenum in the foundry. Ni, Cu and Ca-Si, while not ferroalloys, are often used for special requirements. Considers also the application of silicomanganese, ferrovanadium, silicon-zirconium and silicon-titanium in foundry. VSP + MS (3b)

10

Structure of Rimmed Steel Ingots. T. S. WASHBURN & J. H. NEAD. *Iron Age,* Vol. 139, Feb. 25, 1937, pp. 46-48. **Effect of Furnace and Pouring Practice on Structure.** IDEM. *Blast Furnace Steel Plant,* Vol. 25, Feb. 1937, p. 215. See *Metals and Alloys,* Vol. 8, June 1937, p. MA 346L/6. VSP + MS (3b) 1

Dolomite Tuyeres for the Bottom of a Thomas Converter (Dolomitdüsen-Böden für Thomasbirnen) G. WELTER. *Stahl u. Eisen,* Vol. 57, Feb. 25, 1937, pp. 202-205. The method of pressing the dolomite tuyeres is described; high efficiency is claimed. SE (3b)

Design of Pieces in Cast Steel (La Conception des Pièces en Acier Moulé) TRY-CHALONS. *Rev. Fonderie Moderne,* Vol. 31, Jan. 25, 1937, pp. 19-21. General observations on molding pieces for steel casting to obtain sound castings. Ha (3b) 2

Residual Metals in Open-hearth Steel. JOHN D. SULLIVAN & R. A. WITSCHEY (Battelle Mem. Inst.) *Metals and Alloys,* Vol. 8, Apr. 1937, pp. 99-100. This is the sixth annual report of study of residual metals in open-hearth steel. The data available for the past 6 yrs. show little change in residual metals during 1936. WLC (3b) 3

Arc Refined Stainless Steel Castings. T. W. LIPPERT. *Iron Age,* Vol. 139, Jan. 28, 1937, pp. 18-23. Describes new method of stainless steel production by the Ludlum Steel Co. The furnace is an indirect-arc single-phase type with 2 10 in. hollow graphite electrodes which rotate slowly to insure even wear. Furnace is adapted to production of Cr and Cr-Ni steels for castings. It is capable of producing metal of definite and easily controllable analysis. C content is constantly reduced, often below 0.03%. Alloys of 10% or more of Cr are produced in this furnace. As to machining qualities, metal from hollow-electrode furnace has excellent characteristics. Metal also shows good corrosion resistance. Includes tables giving machining qualities and tensile tests of castings. VSP (3b) 4

Open-hearth Operators Swap Ideas at Birmingham. T. W. LIPPERT (Staff). *Iron Age,* Vol. 139, Apr. 22, 1937, pp. 26-31, 58. Gives brief abstracts of technical papers relating to open-hearth practice read at the Birmingham meeting of the Am. Inst. Mining and Met. Eng., April 7, 1937. VSP (3b) 5

Segregation and Solidification in Steel Ingots. LEON H. NELSON. *Iron Age,* Vol. 139, Feb. 25, 1937, p. 48. Brief abstract of paper read before the Am. Inst. Mining Met. Eng., Feb. 15-19, 1937. See *Metals and Alloys.* VSP (3b) 6

Making a Large Turbo-alternator Stator Yoke Pattern. J. R. MOORHOUSE. *Foundry Trade J.,* Vol. 55, Dec. 31, 1936, pp. 509-510. Practical. The method of molding, and the assembling of the cores of these large cast Fe yokes is described with several drawings. AIK (3b) 7

The Small Cupola (Le Petit Cubilot) GUY HÉNON. *La Fonte,* No. 22, July-Aug. 1936, pp. 831-840. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 215R/4. WHS (3b) 8

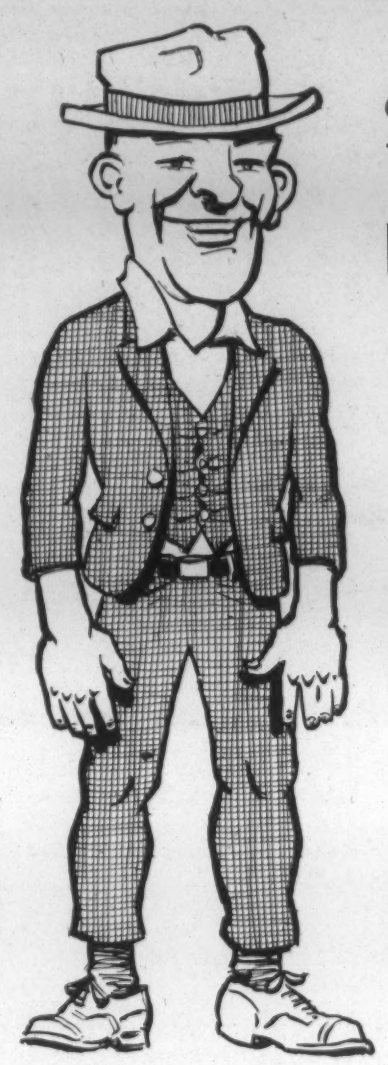
Founding of Pressure Castings. H. H. JUDSON (Goulds Pumps Inc.) *Am. Foundrymen's Assoc.,* Preprint 37-7, 1937, 21 pp. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 70L/7. CEJ (3b) 9

Mass Production of Spun-iron Pipes. *Foundry Trade J.* Vol. 56, Feb. 11, 1937, pp. 134-136. Description of new plant at Nutbrook Works of the Stanton Ironworks Co. Melting plant and normalizing furnace are described. The present output is from 17000 to 18000 3 in. diam. pipes per five day week. AIK (3b) 10

New Works of Wellingborough Iron Company, Limited. *Foundry Trade J.,* Vol. 55, Dec. 31, 1936, pp. 506-508. The description of this plant is given. Ore handling, features of blast furnaces, control equipment, etc., are discussed. The paper is illustrated with several photographs. AIK (3b)

Annual Report. *Bull. Brit. Cast Iron Research Assoc.,* Vol. 4, No. 11, Jan. 1937. The list of research reports (Nos. 2013 to 2023 inclusive) issued since the last *Bulletin* and also of translations (Nos. 141 to 146 inclusive) is given. The President's report and abstracts from foundry literature for the year 1936 are also included in this bulletin. AIK (3b)

Cause of Flakes in Steel Ingots. KOTARO HONDA & TOKUTARO HIRONE (Tohoku Imp. U.). *Metal Progress,* Vol. 31, Apr. 1937, pp. 379, 434, 435. (Abstracted from Science Repts., Tohoku Imp. U., Dec. 1936, p. 713). See *Metals and Alloys,* Vol. 7, July 1936, p. MA 365R/1. WLC (3b)



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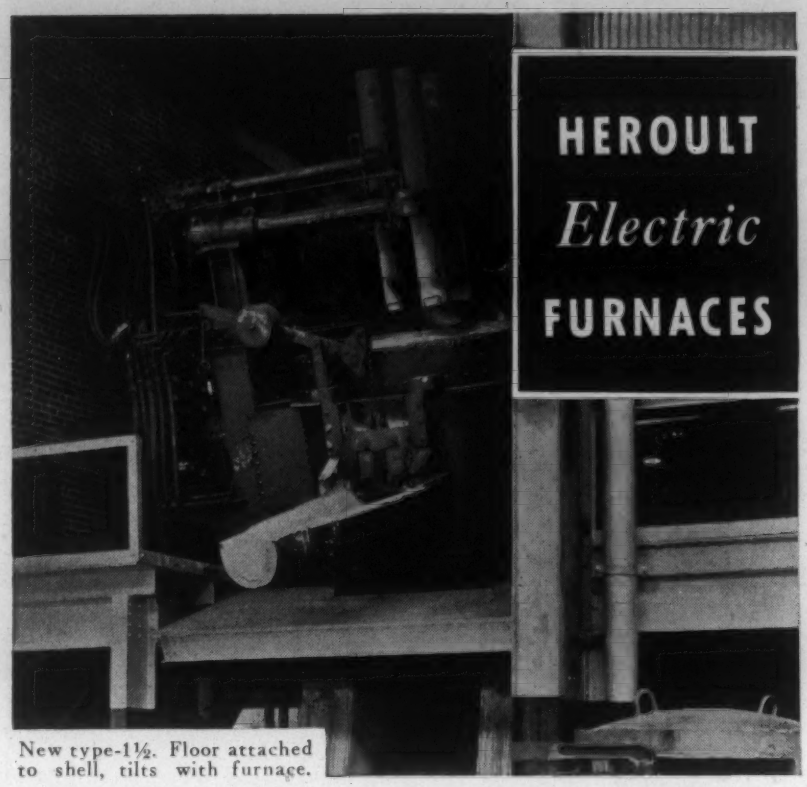

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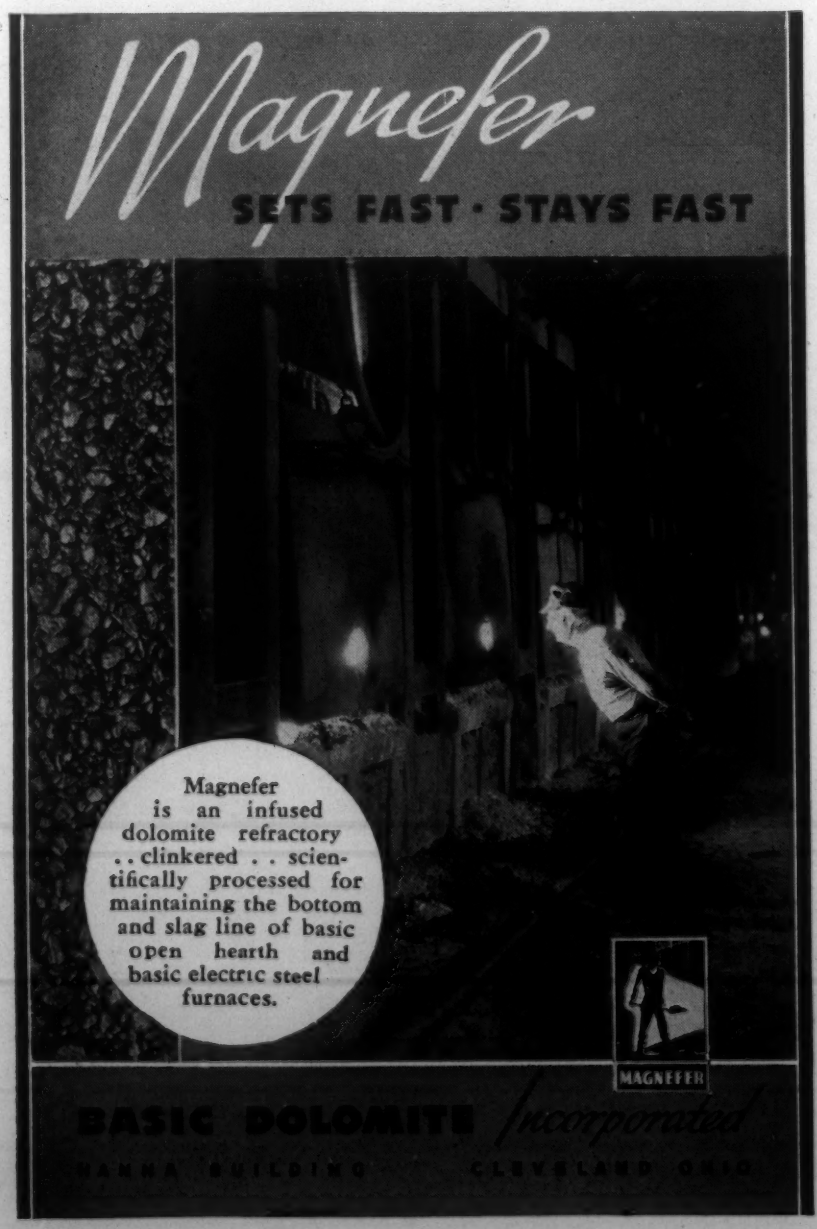
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Michigan Foundrymen Discuss Physical Testing at Fifth Lansing Conference. *Steel*, Vol. 100, Apr. 26, 1937, pp. 82-84. Report of conference, including abstracts of papers read. MS (3b)

Open-hearth Operators Discuss Problems of Steel-making. *Steel*, Vol. 100, Apr. 19, 1937, pp. 60, 62, 81. Report of conference of Open-hearth Committee, Am. Inst. Mining Met. Engrs., at Birmingham, Ala., with abstracts of papers and discussions. MS (3b)

Concentrates on Machine Tools. *Foundry*, Vol. 65, Apr. 1937, pp. 54-57, 152, 157. Plant description of the Bullard Co., 2 Bridgeport, Conn., manufacturers of machine tools. VSP (3b)

On the Oxidizing Effect of Basic Open Hearth Slags (Ueber die Oxydationsfähigkeit basischer Siemens-Martin-Schlacken) P. N. IWANOW & G. A. ROMODIN. *Arch. Eisenhüttenw.*, Vol. 10, Dec. 1936, pp. 229-232. The slags of seventy 90-ton basic open-hearth heats were studied. As the ratio of CaO/SiO_2 increased the FeO content of the slag rose steadily. The oxidizing power of the slag, however, as indicated by the rate of C drop of the 3 bath reached a maximum at a CaO/SiO_2 ratio of 3.0 and then fell off. The ratio of MnO in the slag to Mn in the bath rose rapidly with the CaO/SiO_2 ratio reaching a maximum at a CaO/SiO_2 ratio of 3.2 and then remaining constant. SE (3b)

Reactions in the Basic Open-hearth (Das Reaktionsgeschen im basischen Siemens-Martin-Ofen) G. LEIBER. *Stahl u. Eisen*, Vol. 57, Mar. 4, 1937, pp. 237-249. Doctor's thesis. The author 4 concludes that the O_2 content of the steel bath is governed almost entirely by the C content of the bath; the FeO content of the slag has only a negligible influence. O_2 content of bath and composition of slag during the working of 5 open-hearth heats were determined. The relationship between the C and O_2 content of the bath followed the equilibrium values of Vacher and Hamilton regardless of the FeO content of the slag. The O_2 content of the bath was determined according to Herty's method by killing with Al a test mold filled with molten steel and determining the Al_2O_3 5 formed. The test mold used was that suggested by Schenck, the top being covered with a thin steel disk to prevent the inflow of slag as the mold was inserted into the bath through the slag layer. On the premise that the reaction of C with O_2 in the bath and the escape of CO sets the lower limit for the O_2 content of the bath, the conclusion is drawn that contrary to general opinion a more vigorously reacting bath with a rapid C drop has a lower O_2 content than a quieter bath with a slower rate of C drop. It was also concluded that more Mn is reduced from the slag in a 6 bath with a rapid C drop. In discussion these conclusions were disputed by Schenck. SE (3b)

Some Considerations of Cupola Operation. H. H. SHEPHERD. *Foundry Trade J.*, Vol. 56, Feb. 4, 1937, pp. 113-115; Feb. 11, pp. 139-140. Practical. Construction, diameter of shell, tuyeres, charging, blowing units, lining the cupola, standardized patching, sand bottom and tap hole, slag separating devices, coke bed, 7 charges, etc., are discussed. It is generally advisable to install a cupola which will permit melting of more Fe per hr. than the amount actually required, immediate requirements being controlled by increasing the thickness of the lining. In modern cupola practice it is recognized that pressure is of secondary importance compared to the volume of air entering the furnace. Any correctly operated cupola will melt 10 to 11 lbs. of Fe per $in.^2$ of area at the melting zone; an alternative figure of 0.75 ton per hr. per $ft.^2$ of bore area at the tuyeres can be used. To force a given diameter 8 furnace to give a much greater output than is the correct output for that size by blowing hard is bad practice, as it is likely to result in oxidized Fe and a severely cut lining. The author's practice is to build up the bed to within 3 or 4 in. of the required height and to burn this through until all the coke is a bright red, then 50 or 75 lbs. of limestone are added and the remainder of the bed coke added, after which charging commences, and "blowing" starts immediately afterwards. The paper is illustrated with several photographs and sketches. AIK (3b)

9

Determination of the Basin Capacity of a Cupola. J. A. BOWERS (Am. Cast Iron Pipe Co.) *Am. Foundrymen's Assoc.*, Preprint 37-6, 1937, 4 pp. It is shown that from 35 to 40% of the calculated basin capacity of a cupola is available for molten Fe. CMS (3b)

Nomograms in a Pipe Foundry. C. K. DONOHO (Am. Cast Iron Pipe Co.) *Metals and Alloys*, Vol. 8, Apr. 1937, pp. 93-97. 10 Construction of nomograms is described briefly. Examples of their use in the rapid and accurate calculation of recurring problems of weights and mixtures in the foundry are discussed, with typical charts shown. WLC (3b)

4. WORKING

Shaping in Ship Building with Special Reference to Various Working Methods and their Effect upon the Material (Die Formgebung im Schiffbau unter Berücksichtigung verschiedener Arbeitsmethoden und ihrer Einwirkung auf den Werkstoff) FREUDENTHAL. *Werft, Reederei u. Hafen,* Vol. 18, Mar 15, 1937, pp. 75-79. Review of application of shaping methods (not machines) in shipbuilding, mainly pressing, cutting, bending, flanging, folding, deep drawing. Typical operations are schematically shown in 31 illustrations. EF (4)

Sheet Steels. H. E. BLANK, JR. *Automotive Ind.,* Vol. 43, Mar. 20, 1937, pp. 456-461. Survey. The progress made in the manufacture of sheet steels for the automotive industry is described, giving the latest methods of manufacture. This progress has been made through the demands of manufacturers for wider sheets of lighter gages, with increased ductility and corrosion resistance. The problems involved in meeting these demands are discussed. CMH (4)

Hair Lines in Structural Steels. A. M. PELEVIN & B. KH. SAPIR. *Metallurg,* Vol. 11, Dec. 1936, pp. 26-33. In Russian. Hair lines are assumed to be blowholes elongated by rolling. The defect is rather prevalent; in the plant in which the investigation was conducted, out of 109 rolled heats 66% were scrapped on account of it, out of 150 forged heats only 60% could be shipped. The influence of four electric furnace processes on prevalence of hair lines was studied. In one, good boil was followed by hot finishing under the white slag; in the second good boil was associated with rather cold finishing again under a white slag; straight melting, skimming black slag and cold finishing using FeSi as deoxidizer was used for the third; the last method consisted in straight melting without a boil in an acid lined furnace. Tabulated from the standpoint of hair line content, the results obtained showed that hair lines can be totally eliminated by melting on acid bottom and somewhat reduced by boiling and finishing cold under a white slag in a basic furnace. The amount of hair lines is reduced by increasing the cross section of ingots. (4)

4a. Rolling

S. EPSTEIN, SECTION EDITOR

Instrument Measures Temperature of Steel Billets while in Motion. *Steel,* Vol. 100, Jan. 11, 1937, p. 53. Describes device which includes a thermophotronic tube, potentiometer amplifier, and recorder. MS (4a)

Semi-continuous Wire Rod Mill in Japan. *Indian & Eastern Eng.,* Vol. 78, Apr. 1936, p. 305. Description of one of the latest and most efficient wire rod mills in Japan, installed at the Kobe Steel Works, built by Fried. Krupp Grusonwerk A.G. APS (4a)

Sheets and Circles; Fabricating Processes. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 55. Outlines procedure in rolling Al sheets. MS (4a)

Determination of Friction in Rolling (Die Ermittlung und Grösse der Reibungszahl beim Walzen) T. DAHL. *Stahl u. Eisen,* Vol. 57, Feb. 25, 1937, pp. 205-209. The coefficient of friction μ in rolling depends on the type of surface, temperature, and moisture of work and rolls. In hot rolling μ is about 0.4; in cold rolling 0.1. SE (4a)

The Nomy Blockbearing, a Recently Developed Gliding Bearing (Das Nomy-Blocklager, eine neuzeitliche Gleitlagerbauart) T. DAHL. *Stahl u. Eisen,* Vol. 57, Mar. 25, 1937, pp. 313-319. The Nomy block bearing consists of insertible gliding bearing blocks used for roll bearings. The bearing surface is divided into several segments, which rest against the outer supporting ring at a slight angle. The oil film is thus in the form of a wedge which allows high rolling pressures with low friction. SE (4a)

Development of the Roeckner Tube Rolling Process (Entwicklung des Roecknerschen Rohrwalzverfahrens) J. SEVERIN. *Stahl u. Eisen,* Vol. 57, Jan. 28, 1937, pp. 77-82. In this process a hollow steel billet is hot rolled into tubing by outer and inner rolls. Results on a small old mill and on a larger new mill are described. SE (4a)

Hot-rolling Experiments with Carbon and High-alloy Steels with Different Rolling Conditions (Warmwalzversuche an Kohlenstoff- und hochlegierten Stählen bei verschiedenen Walzbedingungen) A. POMP & G. WEDDIGE (Akad. Clausthal). *Mitt. Kaiser-Wilhelm Inst. Eisenforsch., Düsseldorf,* Vol. 19, No. 5, 1937, pp. 65-86. Original research. Further investigations of the effect of steel composition on its behavior in hot-rolling were made with 2 low and high C, a scale-proof ferritic Si-Cr-Al, an austenitic Cr-Ni, a scale-proof austenitic Cr-Ni, and a heat-resisting, carbide-rich, austenitic Cr-Ni-W steels, at 685°, 875°,1020° and 1185° C. with a reduction of 10, 20, 30 and 40%. The results, presented in detail, show that a higher C content increases the resistance to deformation and required torque only up to about 900° C.; above this temperature, the resistance of the high C is lower than that of the low C steel. The Si-Cr-Al steel behaved similarly. The high-alloy austenitic and carbide-rich steels have, even at the highest temperatures, much higher resistance to deformation than C steels. No definite connection could be established between increase in width, composition and rolling temperature. All investigated steels had the finest structure after rolling at 875° C. except the C steel which had the finest structure at 685° C. The high-alloy steels showed increased grain-coarsening with increasing temperature, even at highest temperatures. Different rolling velocities did not give consistent results as the cooling was of too great influence at lower velocities. A new equation was developed to express the relation between roll pressure and roll energy consumption; the actual energy for rolling the material is determined by $L_r = 0.965 \times l_d \times P \times \omega$, and the energy for overcoming the losses (roll necks, etc.) $L_l = (0.053 \times 2 \times \frac{4}{\pi} \times 60\ P) \times \omega$; l_d is the length of arc on the roll in contact with the steel, P the roll pressure, ω the angular velocity. Diagrams representing this equation for different pressures are given. 26 references. Ha (4a)

Improving Steel Rails by Changing the Fiber Structure at the Base during Rolling (Die Verbesserung von Stahlschienen durch Umgestaltung des Primärgefüges im Schienenfuss beim Walzen) W. LUCKERATH. *Stahl u. Eisen,* Vol. 57, Feb. 18, 1937, pp. 172-179. By using a new series of roll passes of the billet the fibers at the base of the rail are made to extend more nearly parallel to the base than in the old method of rolling. This gives better bend and impact properties, and there is less chance of getting longitudinal tears at the base of the rail. SE (4a)

Republic Cold Rolls Strip at Niles Plant. *Blast Furnace Steel Plant,* Vol. 25, Apr. 1937, pp. 396-397. Describes strip tin-plate mill of Republic Steel Corp. at Niles, O. MS (4a)

4b. Forging & Extruding

A. W. DEMMLER, SECTION EDITOR

Diagnosis of Metal Troubles in Industry. Part I, Forging. J. L. BURNS & V. BROWN (Republic Steel Corp.), *Metal Progress,* Vol. 31, Apr. 1937, pp. 380-385. A series of micrographs and photographs show laps and wrinkles caused by improper die design, scale troubles, overheating and decarburization. WLC (4b)

Plant Specialty Is Large Crankshafts. W. C. KERNAHAN (Staff). *Heat Treating Forging,* Vol. 23, Apr. 1937, pp. 167-169. Describes forging and heat treating equipment and power-plant of the Ellwood City Forge Co., Ellwood City, Pa. MS (4b)

Some Interesting Trends and Equipment Policies of the Drop Forging Industry. R. E. W. HARRISON (Chambersburg Engng. Co.). *Heat Treating Forging,* Vol. 23, Mar. 1937, pp. 129-131. Abstract, entitled "Notes on the Drop Forging Industry," of paper read before the Drop Forging Assoc. MS (4b)

New Methods Employed in Production of Leaf Springs. *Heat Treating Forging,* Vol. 23, Apr. 1937, pp. 188, 191. **Quality of Leaf Springs Is Improved and Output Speeded by New Methods.** *Steel,* Vol. 100, Apr. 5, 1937, pp. 70, 72. Describes equipment developed by the Tuthill Spring Co., Chicago, Ill., for forming and quenching of leaf-springs. MS (4b)

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4c. Cold Working — Shearing, Punching, Drawing & Stamping

Drawing Practice in Automobile Industry (Ziehtechnik in der Automobilindustrie) ERNST GÖHRE. *Tech. Zentralbl. prakt. Metallbearbeit.*, Vol. 47, Feb. 1937, pp. 135-138. General, well illustrated review. EF (4c)

An Unusual Fender Job. J. BEAUDOIN (Buick Motors Co.). *Metal Progress*, Vol. 30, Dec. 1936, pp. 59-63. Descriptive discussion of methods used in the manufacture of deep drawn automobile fenders. Multiple dies, made from nickel cast Fe, permit 4 forming operations at one stroke. Fenders and fender skirt stampings are assembled in a new type welding fixture. GEG (4c)

4d. Machining

H. W. GRAHAM, SECTION EDITOR

Keep Down the Cost of Snagging and Billet Grinding RALPH M. JOHNSON (Norton Co.). *Iron Age*, Vol. 139, Apr. 15, 1937, pp. 49-51. Discussion of practical experience in billet grinding and snagging. Factors considered are selection of right grinding wheel and grinding machine and correct procedure. VSP (4d)

Milling Tools for Machining of Light Metals (Fräswerkzeuge für die Bearbeitung von Leichtmetallen) H. KLEIN. *Aluminium*, Vol. 19, Mar. 1937, pp. 164-166. Review. Recent development of economical milling tools, used with high cutting speed and average feed, are discussed. Ha (4d)

Breaking Up the Chips in Machining with Tantalum-carbide Tipped Tools. P. M. MCKENNA (Vanadium-Alloys Steel Co.). *Machinery, N. Y.*, Vol. 43, Mar. 1937, pp. 435-436. Practical. By providing a small groove in the properly shaped nose of a Ta carbide tool the continuous chips often encountered in high-speed machining are broken up in pieces ½-1" long. Ha (4d)

1 **Drilling Experiments with High-speed Brass and Various Aluminum Alloys (Bohrversuche mit Automaten-Messing und verschiedenen Aluminium-Legierungen)** E. VADERS. *Z. Metallkunde*, Vol. 28, Dec. 1936, pp. 289-390. Original research. Drilling times were measured for high-speed brass, and the special alloys Heddur (Al-Cu-Mg), Pantal (Al-Mg-Si), and Tordal (Al-Cu-Mg- with Pb or Sb, Bi, Sn). The brass machined best with sharp tools, but Tordal was fastest with dull tools. GD (4d)

2 **Recent Investigations of the Machinability of Light-metals, Particularly of Free-machining Alloys (Neuere Untersuchungen über die Zerspanbarkeit von Leichtmetallen, insbesondere von Automaten-Legierungen)** H. OPITZ. *Aluminium*, Vol. 19, Mar. 1937, pp. 150-157. The machinability of light-metal alloys should be judged according to the cutting life of the tools, shape of chip, and surface quality of the material. The influence of cutting angle, feed, depth of chip on these points was tested and results given in curves and micrograms. Ha (4d)

3 **Tools for Drilling, Countersinking, Reaming and Threading of Light Metals (Werkzeuge zum Bohren, Senken, Reiben und Gewindeschneiden in Leichtmetallen)** F. PÜTZ. *Aluminium*, Vol. 19, Mar. 1937, pp. 167-175. Tools for light metals differ from those used for steel in having larger chip grooves and chip angles and smaller pitch. Reaming must be done with general lubrication. Taps for threading should have a left-hand spiral if the thread is to be to dimension; with straight and right-hand spiral the thread is greater than the nominal dimension of the drill. Ha (4d)

4 **Screw Machine Performance on New Aluminum Alloy.** L. W. KEMPF & A. HARTWELL (Aluminum Co.). *Metal Progress*, Vol. 30, Dec. 1936, pp. 34-40. Extensive production tests prove the superior cutting characteristics of the new Al alloy 11 S (analysis not given) compared with the alloy 17 S. Volume of chips, surface finish of machined parts, dimensional tolerances and machine time efficiency serve as criterion for machinability. The new alloy permits a greater variety of tool angles and higher rates of feeding with less tool wear. GEG (4d)

5 **Machinable Aluminum Alloys in the Patent Literature (Die gut zerspanbaren Aluminiumlegierungen im Patentschrifttum)** E. HERRMANN. *Aluminium*, Vol. 19, Mar. 1937, pp. 181-186. Comprehensive review of the world's patent literature on the efforts to manufacture and treat Al and Al alloys to produce short chips. A separate table names 46 American patents and gives the additions to Al. The critical review concludes that Mg and Zn improve chippability. The patent situation in different countries and validity and priority claims are discussed. Ha (4d)

6 **Free Machining Aluminum Alloys Containing Cu-Mg or Mg-Si (Aluminium-Automatenlegierungen auf Al-Cu-Mg-bezw. Al-Mg-Si-Basis)** H. KÄSTNER (Wieland-Werke). *Aluminium*, Vol. 19, Mar. 1937, pp. 140-150. Review. The possibilities of producing Al alloys giving the desirable short chips on automatic machining are discussed. The addition of about 2% Pb which proved advantageous in brass for the same purpose, and also of Bi and Cd gave satisfactory results without impairing mechanical and chemical properties. 3.5% Cu, 0.5% Mn, 0.5% Mg with from 0.4 to 2% Bi gave good, short chips, while the tensile strength was reduced from 61,000 lbs./in.² (without Bi) to 51,000 lbs./in.² and Brinell hardness from 104 to 92 at 0.8 and to 88.7 at 2% Bi. Numerous tables illustrate the change in properties with these additions, and the results show clearly that simultaneous use of several chip-shortening additions has a better effect than the same total amount of a single element. Ha (4d)

7

8

9 **Tool Life and Balance of Heat in Lathe Work.** RAGNAR WOXEN. *Ing. Vetenskaps Akad. Handl.*, No. 142, 1937, pp. 5-39. In English. Original research. A method for constructing tool-life equations in lathe work is submitted. A heat balance is deduced and tool life equations are derived from it for 2 cases (a) without and (b) with cooling medium. In agreement with previous research it is found that the "chip equivalent" is the physical basis for a tool-life equation. Since a "simple" relation exists between cutting speed, chip equivalent and tool-life, a method has been elaborated for making tool-life tests which "considerably simplifies and cheapens these tests." EF (4d)

10 **The Machinability of Metals.** O. W. BOSTON. *Can. Chem. Met.*, Vol. 21, Mar. 1937, pp. 87-88. Review. The cutting properties of metals depend upon a number of completely independent factors. Major among these properties are: the metal, the cutting tool, the cutting fluid, the process or type of machine, the size and shape of the cut, and the general cutting conditions. The variables involved in each of these properties are listed. 9 references. WHB (4d)

5. HEAT TREATMENT

O. E. HARDER, SECTION EDITOR

Effect of Water Vapor on Hot Metal. A. G. HOTCHKISS (Gen. Electric Co.). *Metal Progress,* Vol. 31, Apr. 1937, pp. 375-379. General review. A diagram shows the equilibria between steel and H_2-H_2O mixtures and between steel and CO_2-CO mixtures at various temperatures. The problem of heating and cooling steel without oxidation in atmospheres of H_2, CO_2, CO and H_2O is discussed in the light of these equilibria. Various methods of removal of water from gases are discussed and data are given on dew points. A "dew meter" is described which is convenient, portable and accurate. It passes the gas under investigation over a mirror cooled by a jet of cold gas e.g. CO_2 from a cylinder. The temperature of the mirror is followed with a thermocouple and the appearance of dew on it observed through a window in the instrument. WLC (5)

Residual Tangential Stresses in Hollow Steel Cylinders Cold Worked on the Inside. E. S. TOVPENETS & P. S. SAKHAROV. *Metallurg,* Vol. 11, Dec. 1936, pp. 36-42. In Russian. Original research. Removal of residual stresses in heavy walled steel pipes was investigated. Measurements were made according to Davidenkov method, which is described. For a steel with 0.48% C and 0.65% Mn a 10 min. tempering at 600° C. completely removes all stresses. (5)

Thermal Refining of Cast Iron (Ueber die thermische Vergütung von Gusseisen) E. PIWOWARSKY & E. SÖHNCHEN (Technische Hochschule, Aachen). *Giesserei,* Vol. 24, Feb. 6, 1937, pp. 97-106. Correlated abstract. Attempts to improve the properties of cast Fe are discussed and recent experiments in this direction described. Moderate additions of Ni, Cr and Mo increased strength considerably especially in cast or annealed state. Wear resistance of gray Fe can be increased by quenching. High tensile strength accompanies high wear resistance, but the corrosion resistance is generally reduced by quenching. Complicated castings will not lend themselves readily to oil quenching; air quenching will usually be required. C contents below 2.2% give difficult conditions with respect to graphite; undercooling in such cases should be minimized suitably. 10 references. Ha (5)

5a. Annealing

Selection of Cycle and Furnace for Annealing Malleable Iron. A. F. LANDA (Central Scientific Research Inst. Machine-Building, Moscow). *Am. Foundrymen's Assoc.,* Preprint 37-4, 1937, 20 pp. Descriptive. There is no "accelerated" annealing of malleable Fe but rather an optimum annealing cycle, depending upon the Fe to be annealed and the furnace equipment available. A type of tunnel kiln devised by Russian engineers is described. CMS (5a)

The Annealing of Welded Work. CHAS. H. JENNINGS (Westinghouse Elec. & Mfg. Co.). *Machinery, N. Y.,* Vol. 43, Mar. 1937, pp. 449-451. Practical. Methods of determining when welds should be annealed for stress-relieving or producing desired metallurgical changes are discussed. In general, statically loaded structures need not be annealed, although dynamically loaded structures and work that requires accurate machining and must not distort during its service life should be annealed. Temperatures to be applied range between 1000° and 2100° F. depending on material and purpose. Ha (5a)

5b. Hardening, Quenching & Drawing

Tempering, Hardening and Nitriding of Gray Cast Iron (Das Vergüten, Härten und Nitrieren von Grauguss) BRÜHL & P. A. HELLER (Krupp, Essen). *Durferrit Hausmitt.,* Vol. 6, Feb. 1937, pp. 107-130. Comprehensive well-illustrated survey on development, composition and heat treatment (including nitriding) of gray cast iron. Increase of wear resistance attained by heat treatment is of special interest. Composition of cast iron for nitriding must be carefully chosen. The following typical composition is given: C: 2.5%, Si: 2.5%, Mn: 0.6%, P: <0.2%, S: <0.1%, Cr: 1.2%, Al: 1%. GN (5b)

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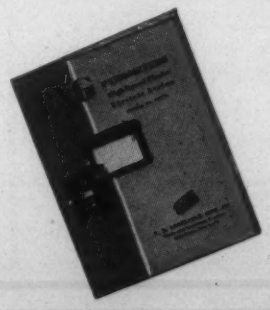

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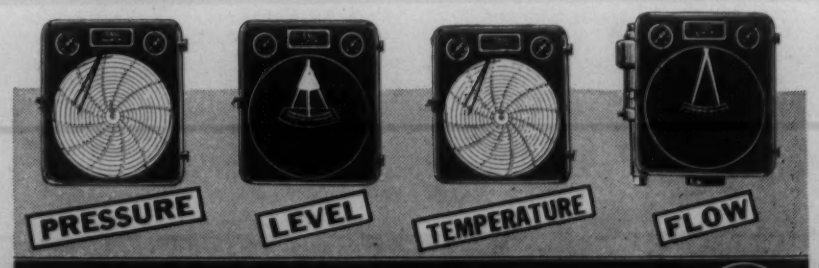

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5c. Aging

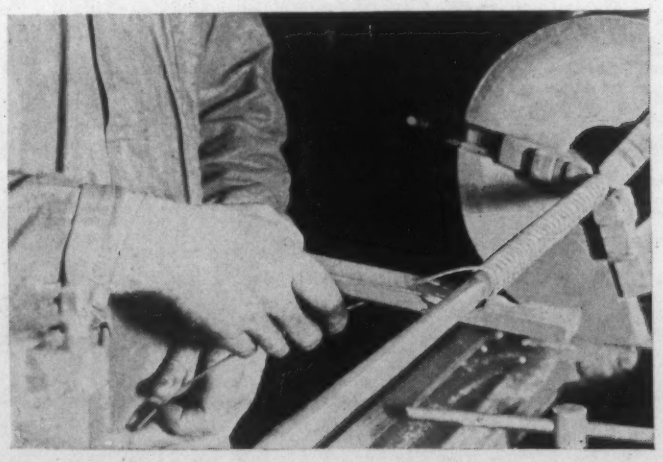
Silver-copper-silicon Alloys. Notes on the Aging of Silver-rich Ones. T. C. JARRETT (Amer. Optical Co.). *Metals and Alloys*, Vol. 7, Dec. 1936, pp. 309-313. Original research. A study is made of the aging characteristics of coin Ag and of 3 Ag-rich alloys containing increasing amounts of Cu (2, 3, 7%) and Si (0.15, 0.30, 0.90%). GEG (5c)

5d. Carburizing

The Carburization of Steels of Krupp Analysis. W. J. WHIPPLE. Thesis, Carnegie Inst. Tech., 1936, 38 typed pages. Samples of four lots of steel containing 1.75 to 3.79% Ni and 0.73 to 1.72% Cr were carburized to obtain information on the factors affecting rates and depth of C penetration. A review of previous work in carburization and diffusion of carbon is presented and the relative importance of factors affecting rate of carburization is discussed. It was found that initial grain size had a marked effect on rate of carburization of a steel, and that the variation in alloy content among the different lots of steel had a slight effect on respective rates of carburization. CWS (5e)

5f. Nitriding

Cast Iron Suitable for Nitrogen Hardening. J. E. HURST. *Am. Foundrymen's Assoc.*, Preprint 37-22, 1937, 18 pp. Review. Alloy cast irons suitable for N hardening are essentially alloy cast irons containing Al and Cr. Typical analyses and mechanical test results are summarized. The data given are for both sand cast and centrifugal cast material. The hardening and stabilizing treatments are listed. Details of the N hardening process are discussed in detail with furnace considerations reviewed. General details of procedure in the preparation of articles for treatment are outlined. CEJ (5f)



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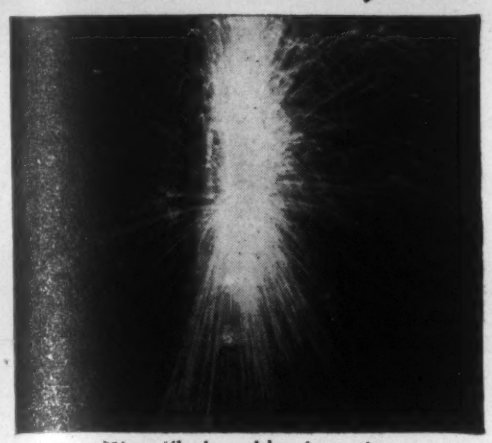

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6. FURNACES, REFRACTORIES AND FUELS

M. H. MAWHINNEY, SECTION EDITOR

The Firing of Open-hearth Furnaces in German Steel Works. FRIEDRICH WESEMANN. *Engineer,* Vol. 162, Oct. 2, 1936, pp. 359-360. *Blast Furnace Steel Plant,* Vol. 25, Mar. 1937, pp. 313, 319. **(Die Beheizung von Siemens-Martin-Oefen in deutschen Stahlwerken)** IBID. *Stahl u. Eisen,* Vol. 56, Sept. 17, 1936. See *Metals and Alloys,* Vol. 8, May 1937, p. MA 270R/1. VSP + MS + SE (6)

Recent American Work on Refractories. ALFRED B. SEARLE. *Iron & Steel Ind.,* Vol. 10, Oct. 1936, pp. 118-119. *Heat Treating Forging,* Vol 23, Mar. 1937, pp. 146-148. *Blast Furnace Steel Plant,* Vol. 24, Nov. 1936, pp. 1013-1014; Dec. 1936, pp. 1108, 1110. Survey, covering clays, silica brick, magnesite and special refractories, insulating bricks, refractory cements, steel furnaces and testing. 24 references. CEJ + MS (6)

Temperature Measurement and Control of Small Industrial Furnaces, particularly the Common Hardening Furnaces (Temperatur-Messung und -Regelung für industrielle Kleinöfen unter besonderer Berücksichtigung der gebräuchlichsten Härteofen-Typen) H. O. MEYER. *Tech. Zentrallbl. prakt. Metallbearbeit.,* Vol. 46, Dec. 1936, pp. 848-855. Extensive review and practical hints. Discusses temperature measurement, temperature control and control instruments. See *Metals and Alloys,* Vol. 8. May 1937, p. MA 292L/9. EF (6)

Simplified Calculations for Accumulative Heat Interchangers (Vereinfachte Berechnung von speichernden Warmeaustauschern) K. RUMMEL & F. KESSLER. *Arch. Eisenhüttenw.,* Vol. 10, Dec. 1936, pp. 233-242. Sample calculations and nomograms for calculating the temperature attained and heat input for such heat interchangers as blast furnace stoves and open-hearth checker chambers. SE (6)

The Technique of Furnace Atmospheres (Die Technik von Öfenatmosphäre) G. NEUMANN. *Arch. Eisenhüttenw.,* Vol. 10, Jan. 1937, pp. 285-296. A correlated abstract on controlled atmospheres. 27 references. SE (6)

Status of the Development of Continuous Normalizing Furnaces for Sheet (Stand der Entwicklung der Durchlaufglühöfen für Feinbleche) F. LÜTH. *Stahl u. Eisen,* Vol. 57, Apr. 8, 1937, pp. 365-372. The development of German continuous normalizing furnaces for sheet since 1930 is reviewed and the most recent type furnaces described and illustrated along with heating curves and production data. SE (6)

Electrical Nitriding Furnace (Elektrische Nitrieröfen zur Oberflächenhärtung) H. ZERPNER. *Elektrizitätswirtschaft,* Vol. 35, July 25, 1936, pp. 557-558. EF (6)

Modern Industrial Ovens Designed to Suit Individual Requirements. RALPH BYRON. *Steel,* Vol. 99, Aug. 3, 1936, pp. 50, 52, 55-56. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 148R/7. MS (6)

Changes in Gas Furnace Construction Cut Melting Cost. J. B. NEALEY (Am. Gas Assoc.). *Foundry,* Vol. 65, Feb. 1937, pp. 32-33. Describes new design of gas fired melting furnaces built by E. A. Williams & Son, Inc., Jersey City. Capacities of furnaces and the speed of melting have been increased with little or no increase in gas consumption. VSP (6)

Malleable Castings Annealed in 31 Hours by Gas Fired Furnace. *Steel,* Vol. 100, Mar. 1, 1937, pp. 68-69. See *Metals and Alloys,* Vol. 8, June 1937, p. MA 356R/10. MS (6)

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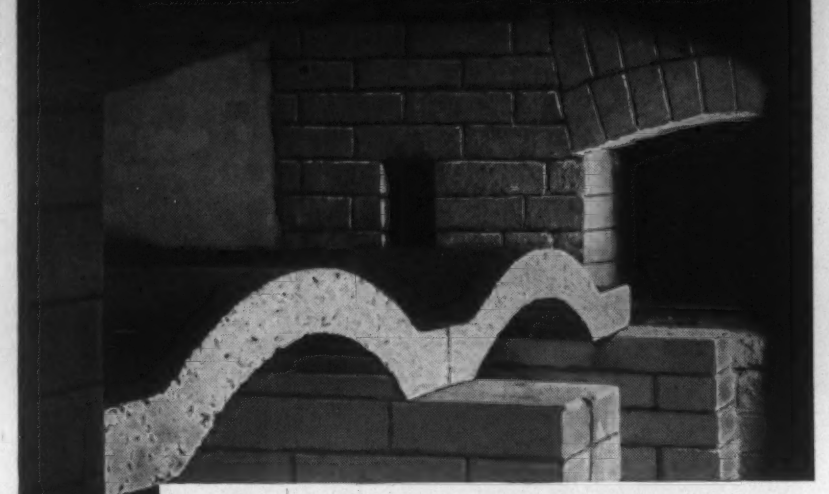

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Tractor Cores Are Dried in Vertical Ovens. *Foundry,* Vol. 65, Apr. 1937, p. 80. Describes a vertical oven and auxiliary equipment for cores ranging in size from 162 to 930 lb. installed at the plant of Caterpillar Tractor Co. Installation was made by the Detroit Sheet Metal Works. VSP (6)

Brunorized Rails Have Exceptional Properties. *Blast Furnace Steel Plant,* Vol. 25, Apr. 1937, pp. 385-387. *Heat Treating Forging,* Vol. 23, Apr. 1937, pp. 193-195. See *Metals and Alloys,* Vol. 8, June 1937, p. MA 358L/3. MS (6)

Pulverised Fuel Foundry Equipment. *Mech. World Eng. Record,* Vol. 100, Oct. 23, 1936, pp. 392-394. The plant described represents a complete set of equipment for the preparation, storage and use of pulverized fuel on a large scale. In addition to boilers, the melting furnaces, annealing ovens and reheating furnaces are fired by the one system. WH (6)

Temperature Gradients in Furnace Walls. J. S. F. GARD. *Foundry Trade J.,* Vol. 56, Feb. 18, 1937, pp. 151-152. See *Metals and Alloys,* Vol. 8, May 1937, p. MA 282R/2. AIK (6)

Continuous Mechanical Furnaces for Reheating and Heat Treatment of Steel. JOHN FELLON. *Proc. Staffordshire Iron Steel Inst.,* 1935-36, Vol. 51, pp. 58-69, discussion pp., 69-73. Descriptive survey. After referring to the principal features of batch furnaces for the annealing of steel sheets and the preheating of bars, the author describes the chief types of continuous furnace now being used, their special features, and the service they may be expected to give. GTM (6)

The Testing of Refractories and Insulation. *Ind. Heating,* Vol. 4, Apr. 1937, pp. 319-322, 328. Review of several recent papers on this subject and some conclusions for practical use in the manufacture of insulating fire brick. Ha (6)

Developments in Heating Small Stock. *Heat Treating Forging,* Vol. 23, Apr. 1937, p. 200. Describes several types of automatic electric forging heaters, which employ the contact resistance method of heating, using electrodes to grip stock. Photoelectric controllers over each electrode control temperature. MS (6)

1 **Insulating Refractories.** G. A. BOLE (Ohio State Univ.). *Am. Foundrymen's Assoc., Preprint* 37-20, 1937, 12 pp. Review of methods of manufacture, properties, testing, specifications and applications of an insulating refractory. The use of large shapes is advocated. Properties of various samples are tabulated. Advantages of use are discussed under thermal conductivity and furnace construction. Practical hints are given for the user. CMS (6)

2 **The Silica Refractories: Their Production and Properties.** W. J. REES (Univ. Sheffield). *Iron & Coal Trades Rev.,* Vol. 134, Apr. 9, 1937, p. 663. When manufacturing silica brick, a change from quartz to tridymite or cristobalite occurs; which of the two is formed depends on the amount of impurities. With pure material, heating produces a change to cristobalite, but if impurities are present, tridymite is also formed. If silica bricks are burnt thoroughly all quartz is changed to crystobalite and tridymite with a glassy matrix (the lime-alumina silicate) which must be cooled slowly and uniformly, particularly in the range from 300° to 200° C. British and American practices are compared. Ha (6)

3 **Continuous Special Atmosphere Malleable Annealing Furnace.** *Iron Age,* Vol. 139, Mar. 4, 1937, p. 58. **Malleable Castings Clean Annealed in New Type Furnace.** *Heat Treating Forging,* Vol. 23, Feb. 1937, pp. 95-96. **Anneals Malleable Free of Scale.** *Steel,* Vol. 100, Feb. 22, 1937, p. 66. For short-cycle annealing special analysis malleable castings used for automobile parts, a continuous roller-hearth type furnace is used. Capacity is 30 tons/day, cycle 13 hrs. in the furnace, which is gas tight and provides a non-oxidizing atmosphere. VSP + MS (6)

4 **Making Pig Iron by Reduction of Iron Ore in Electric Furnace (La Fabrication de la Fonte par Réduction du Minerais de Fer au Four Électrique)** *J. Four Elec.,* Vol. 46, Feb. 1937, pp. 56-58. Descriptive. Tysland-Hole furnaces are the only type used in France at present for pig Fe manufacture. 8 are in operation varying from 6000 to 9000 kw., costing about $170,000 apiece. High voltages at the electrodes reduce induction giving efficiency of 0.8-0.9. Coke breeze can be used as a reducer with complete satisfaction. Large proportion of fine ore does not interfere, and desulphurization is complete. Furnaces are simple in construction and suitable for use on ferro alloys. JDG (6)

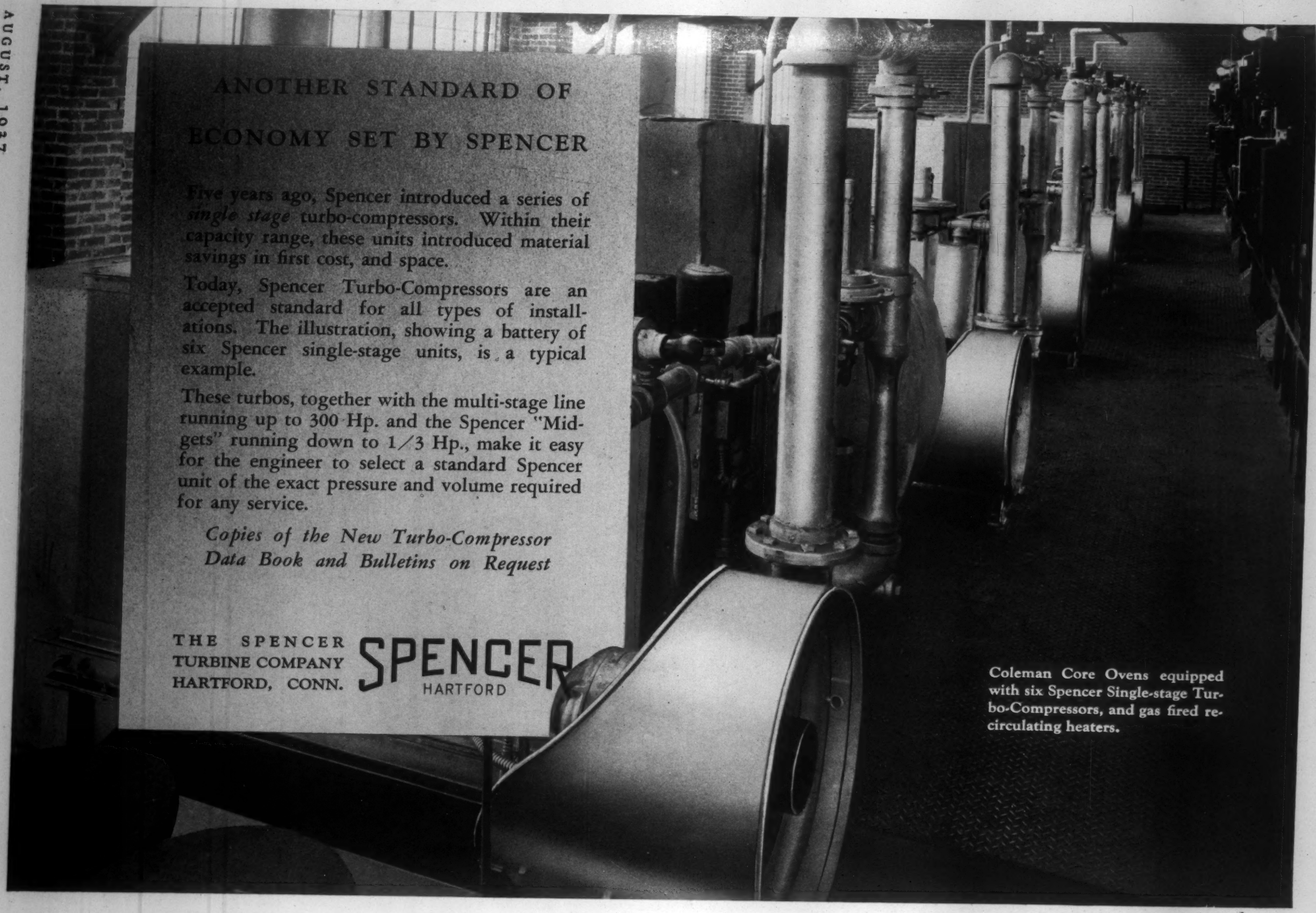
5 **Zircon as a Ceramic Material.** GEORGE C. BETZ. *Foote-Prints,* Vol. 9, Dec. 1936, pp. 15-23. Review. Theoretically pure zircon 67.2 ZrO_2, 32.8% SiO_2 is closely approached in analysis of good grade commercial product 66.13 ZrO_2, 31.31% SiO_2, etc. Physical properties of zircon sand are reviewed and use in specialized porcelains which have high strength and high thermal shock resistance due to low expansion. Properties of porcelain for electrical purposes are indicated. Chemical resistance, use as high temperature refractory, zircon in glass, enamels and cements are noted. WB (6)

6 **Composition of the Non-condensible Gases from a Charcoal Burner (Sammansättningen hos den Okondenserbara Gas, som Avgår Från en Skorstensmila)** HILDING BERGSTRÖM. *Jernkontorets Ann.,* Vol. 120, Nov. 1936, pp. 698-702. Analyses of the gases from a charcoal burner were followed over a period of 124 hrs. The initial gas contains 1.6% CO_2, 0.2% C_nH_{2n}, 19% O_2, 0.4% CO, 0.2% H_2, 0.0% CH_4. The final gas is 17.8% CO_2, 1.0% C_nH_{2n}, 1.8% O_2, 4.0% CO, 15.9% H_2 and 6.8% CH_4. HCD (6)

7 **Maintenance of Salt-bath Furnaces (Pflege von Salzbadöfen)** R. HARDER. *Durferrit Hausmitt.,* Vol. 6, Feb. 1937, pp. 145-152. In German. The life and economy of industrial furnaces can be materially improved by proper care and timely removal of minor defects. Information is given on suitable care of salt bath furnaces with special reference to brick work. GN (6)

8 **Electrical Characteristics of Arc Furnaces.** T. HAYASI & H. NODA. *Tetsu-to-Hagane,* Vol. 23, Jan. 25, 1937, pp. 1-10. In Japanese. Practical. Importance of studying the electrical characteristics of electric arc furnaces is discussed. As illustration of the electrical characteristics, calculations for the design of several furnaces and approximate formula based on previous experience are given, and the results obtained from the preliminary calculation and the actual test of completed furnaces are compared. NS (6)

9 **Savings with Insulating Refractories.** J. G. COUTANT (Quigley Co.). *Chem. & Met. Eng.,* Vol. 44, Mar. 1937, pp. 137-138. **Reanalysis of Refractory Heat Loss on Basis of Heat Capacity.** IBID. *Blast Furnace Steel Plant,* Vol. 25, Apr. 1937, pp. 440-441. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 148R/6. PRK + MS (6)



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7. JOINING

7a. Soldering & Brazing

C. H. CHATFIELD, SECTION EDITOR

Soldering in the Salt Bath (Hartlötung im Salzbad) E. SCHAU. *Durferrit Hausmitt.*, Vol. 6, Feb. 1937, pp. 137-144. Description of methods applied in soldering bicycle frames in the salt bath. Salt bath serves both for transfer of heat and as reducing medium. If the solder is properly applied considerable amounts of solder can be saved by this method. Whereas in the older type of dip soldering at least 100 g. of brass are required, method described requires but 15 g. at the most. GN (7a)

7b. Welding & Cutting

E. V. DAVID, SECTION EDITOR

Power Plant Piping. W. A. BENOIST (Anheuser-Busch, Inc.) *Intern. Acetylene Assoc.*, Nov. 1936, 4 p. preprint. Review of advantages in welded piping, for steam, water, air ,ammonia, and brewery products. Absolute tightness of lines and superior operating characteristics are obtained. Maintenance is minimum, installation costs less and streamlining of system without joints, abrupt bends, etc., is possible. WB (7b)

Reports on Tests of Electric Welds. S. R. BEITLER. *Oil Gas J.*, Vol. 35, Sept. 24, 1936, pp. 184-184-D. A series of tests, conducted by the Ohio Fuel Gas Co., Columbus, Ohio, to determine the efficiency of arc welded joints in pipe, revealed that such joints exceeded the company's requirements for satisfactory welded joints by a considerable margin. For the straight butt welds, electric arc welds of the type used for the tests can be made in about 14 min. The welds were stronger than the pipe in all cases. There was no tendency of failure along the axis of the pipe, which fact was expected as the unit stress along the axis of a pipe is only ½ the hoop tension. From the tests of the miter welds, it would appear that for joints subject to deformation from external sources, electric arc welds meet requirements. The use of the chill ring for the electric arc weld increases the stiffness of the weld. VVK (7b)

Practical Experiences and Directions for the Welding of Zinc, Galvanized and Leaded Iron Sheets (Praktische Erfahrungen und Richtlinien für die Schweissung von Zink, verzinkten und verbleiten Eisenblechen) W. ANDERS. *Autogene Metallbearbeit.*, Vol. 30, Feb. 1, 1937, pp. 33-36. The difficulties of welding of Zn because of the formation of Zn oxide are discussed and attempts to remove them described. Air-acetylene flames gave poor results; oxy-acetylene flames were successful when using a small steady flame; the consumption of both gases in 20-35 l./hr. A pure Zn welding rod is used. The seam has a fairly coarse grain which, however, does not seem to affect adversely the mechanical properties or corrosion resistance of the weld. Grain refinement can eventually be obtained by subsequent heating to 140°-150° C. The complete procedure is described. Ha (7b)

New Oxy-acetylene Butt Welding—Techniques for Steel. C. G. BAINBRIDGE. *Welding Ind., London,* Vol. 5, Feb. 1937, pp. 8-11. Detailed and well illustrated discussion of new French method of vertical upward welds on square edged plates. The method is commended for assurance of penetration, economy and weld completion in one pass. Welder fatigue is less due to lighter torch and less discomfort from smaller flame. For plates over 3/16" two welders are used, one on each side, giving greater overall advantages, the bead formed is double V type and symmetrical. As a consequence distortion is negligible. WB (7b)

Preparation and Extension of Butt Welds (Die Vorbereitung und Schweissung von Stumpfnähten) R. MALISIUS. *Werft, Reederei u. Hafen,* Vol. 17, Oct. 23, 1936, pp. 323-326. 45 different forms of butt welds are illustrated and discussed. Application, pros and cons of the major types are pointed out. EF (7b)

Modern Oxy-acetylene Welding Methods Compared with Electric Arc Welding. M. R. MESLIER. *Welding Ind., London,* Vol. 4, June 1936, pp. 188-191. Discussion and tabular data for gas and arc welds in steel plates 4-30 mm. thick. Survey indicates gas welding in France is cheaper than arc welding. WB (7b)

—

A Contribution to the Study of Weldability in Steels. J. BRILLE & D. SEFERIAN. *Welding Ind., London,* Vol. 4, June 1936, pp. 169-175. Discussion and review of the Chevenard micro machine for testing small specimens for tensile and shear properties. Some results obtained with the machine are reported.
2 Classifications of steels as to weldability is made on the basis of uniformity of physical properties across the weld, ideal weldability being 0% increase in strength of transition zone and 0% decrease in elongation. Limit of weldability considered to be for steel with
— 18-21% increase in strength and 20-22% decrease in elongation in transition zone. WB (7b)

Influence of Slag Inclusions on the Quality of Electric Resistance Butt Welds. H. BLOMBERG. *Welding Ind., London.* Vol. 4, Jan. 1937, pp. 451-454. Steels with large number of slag
3 inclusions are difficult to weld on resistance welder and give low strength welds due to high degree of porosity caused by welding operation. Time of welding is of importance in strength obtained
— and the more rapid the operation the lesser effect slag inclusions have on reducing strength. Flash weld is more rapid and gives higher quality joint where slag is present, also thickness of steel in affecting welding time affects strength of joint. WB (7b)

4

A Study of the Widmanstätten Structure in Welds. N. T. BELAIEW & D. SEFERIAN. *Welder,* Vol. 8, Aug. 1936, pp. 1041-1048; *Engineering,* Vol. 141, June 19, 1936, p. 674. Research by
— the author is reviewed in which structures formed during secondary crystallization are shown to be of 3 types: (1) cellular or reticulated with grains outlined by ferrite or cementite, (2) crystallographic structure parallel to cleavage planes (Widmanstätten),
5 (3) large crystal with secondary structure parallel to crystallographic axes. Haneman's work is cited in determining the cooling rates from 1200° C. and from 10° C. above A_3 to produce granular, Widmanstätten, net and ferrite margin structures for steels of various C content. The effect of the higher temperature is to
— increase the C and cooling rate range in which the Widmanstätten structure (hereafter, W-structure) is produced. The W-structure may be present in all welding processes, in either the weld metal or the overheated parent metal, depending upon the thermal cycle;
6 especially favorable conditions for its appearance are cited for oxy-acetylene welding. Factors governing W-structure formation are (a) chemical composition, (b) max. temperature attained above A_3, (c) duration of γ region temperature, (d) cooling velocity through
— transformation points. The interlamellar distance between the pearlite lamellae of the W-structure permits classification into sorbitic or pearlitic W-structure depending upon whether the interlamellar distance is of the order of .22μ as for sorbite or .25μ as for pearlite. Low C favors pearlitic, high C sorbitic structure.
7 The effect of C on formation of the W-structure in arc and oxy-acetylene welding of parent metal containing (1) .02% and .04% C, (2) .19% C, (3) .37% C, and (4) .46% C is discussed from the data obtained in micro hardness tests and micro shear tests on
— small samples cut progressively from parent metal, transition zone and weld metal. In all cases except (1) the W-structure was produced in the parent metal next to weld bead. For (2) the arc gave a sorbitic W-structure and the torch a pearlitic W-structure. For (3) the W-structure was found both in parent metal next to
8 weld bead and in the weld. The mechanical properties of micro specimens of the W-structure regions are given and show 18-20% elongation, sorbitic W-structure. In the arc weld the W-structure was less defined than in torch weld. Concludes that C increase favors W-structure, especially in torch welding. In the curves of
— (3) for elastic limit, elongation, tensile strength, and hardness *vs.* distance from weld bead for arc and torch welds, the peaks of the curves are in the sorbitic region and decrease to some extent in the W-structure region. See also *Metals and Alloys,* Vol. 8, Apr.
9 1937, p. MA 218L/1. WB (7b)

Welding of German Freight Railroad Cars for Special Purposes (Schweissen im Wagenbau bei Grossgüterwagen und Kübelwagen) WOLFGANG BODE. *Organ. Fortschr. Eisenbahnw.*, Vol. 91, June 15, 1936, pp. 257-264. Gives practical details on construction and welding of German special freight cars. The majority of the accompanying 20 illustrations emphasize welding
10 features. EF (7b)

Canada's Largest All-welded Bridge. H. F. DAVIS (Lincoln Electric Co.). *Welding Engr.,* Vol. 22, Mar. 1937, pp. 34-35. Descriptive. WB (7b)

Should Edges Cut by Automatic Torches be Approved in Boiler and Pressure Vessel Construction without Finishing Treatments? (Können maschinell hergestellte Brennkanten ohne Nachbearbeitung und ohne Nachbehandlung im Kessel- und Druckgefässbau zugelassen werden?) R. HESSLER. *Wärme*, Vol. 60, Feb. 27, 1937, pp. 137-148. Review plus original research. Flats cut by the autogenous process from boiler plate were submitted to tensile, bending, impact, broaching, hardness, riveting, caulking and microscopic tests and are critically compared with analogous samples made by machining. The torch affected the material to a depth of 1.8 mm. and 0.3 mm. respectively at the upper and lower side of the plate or test bar causing a maximum hardness increase of 15%. Yield point was raised 9% and elongation dropped 10%. Practically no effect on ultimate strength, reduction of area, impact strength, bendability and suitability for riveting and caulking were observed. Edges cut in shears are inferior to edges cut by torch which in turn are not inferior to machined edges. EF (7b) — 1 — 2

The Welding of Copper and Its Alloys—A Review of the Literature to Jan. 1, 1936. IRA T. HOOK. *Welding J.*, N. Y., Feb. 1937 Supplement, pp. 7-31; Mar. 1937 Supplement, pp. 33-46. Comprehensive, thorough review bringing into one source the important data on the subject. Division is into 8 parts; (1) General metallurgy of Cu (2) Cu, deoxidized Cu, (3) Cu-Zn alloys, (4) Cu-Sn alloys, (5) Cu-Si alloys, (6) Cu-Ni alloys, (7) Cu-Cd, Cu-Al, Cu-Be alloys, (8) Miscellaneous welding processes involving Cu alloys. The author's experience in the field is used in personalizing the review and in weeding out poor or misleading data and indicating direction for improvement. A list of 210 references on the subject is appended. WB (7b) — 3 — 4

Shrinkages and Shrink Stresses in Fusion Welding. S. A. ESKILSON. *Mech. World Eng. Record*, Vol. 100, Aug. 14, 1936, pp. 147-149; *Engineering*, Vol. 141, June 19, 1936, pp. 675-676. Presented at 12th Int. Cong. Acetylene, Oxy-acetylene Welding, and Allied Industries. Heating of the joint edges during welding causes them to become bent inward and the weld itself contracts on cooling. These tendencies must not be allowed to affect the parts to be welded later or undesirable stresses in the job will arise. The use of adjusting tools to avoid this is fully described. WH + VSP (7b) — 5

Fundamentals of Spot Welding with Particular Reference to Electrode Life. E. I. LARSEN. *Sheet Metal Ind.*, Vol. 10, June 1936, pp. 483-486. See *Metals and Alloys*, Vol. 7, Sept. 1936, p. MA 452R/3. AWM (7b) —

Arc Welded Bridges—A Survey. A. RAMSAY MOON. *Welder*, Vol. 8, Sept. 1936, pp. 1062-1072. See *Metals and Alloys*, Vol. 7, Jan. 1937, p. MA 26L/4. WB (7b) — 6

Welding Helps the Salt Miner. S. H. ZIMMERMAN. *Ind. & Welding*, Vol. 8, Sept. 1936, pp. 24-26. See *Metals and Alloys*, Vol. 7, Dec. 1936, p. MA 590R/8. WB (7b) —

Jigs For Oxy-Acetylene Welding. Part II. *Ind. & Welding*, Vol. 10, Jan. 1937, pp. 24-30. Details are given for variety of jigs. See also *Metals and Alloys*, Vol 8, Feb. 1937, p. MA 89R/5. WB (7b) — 7

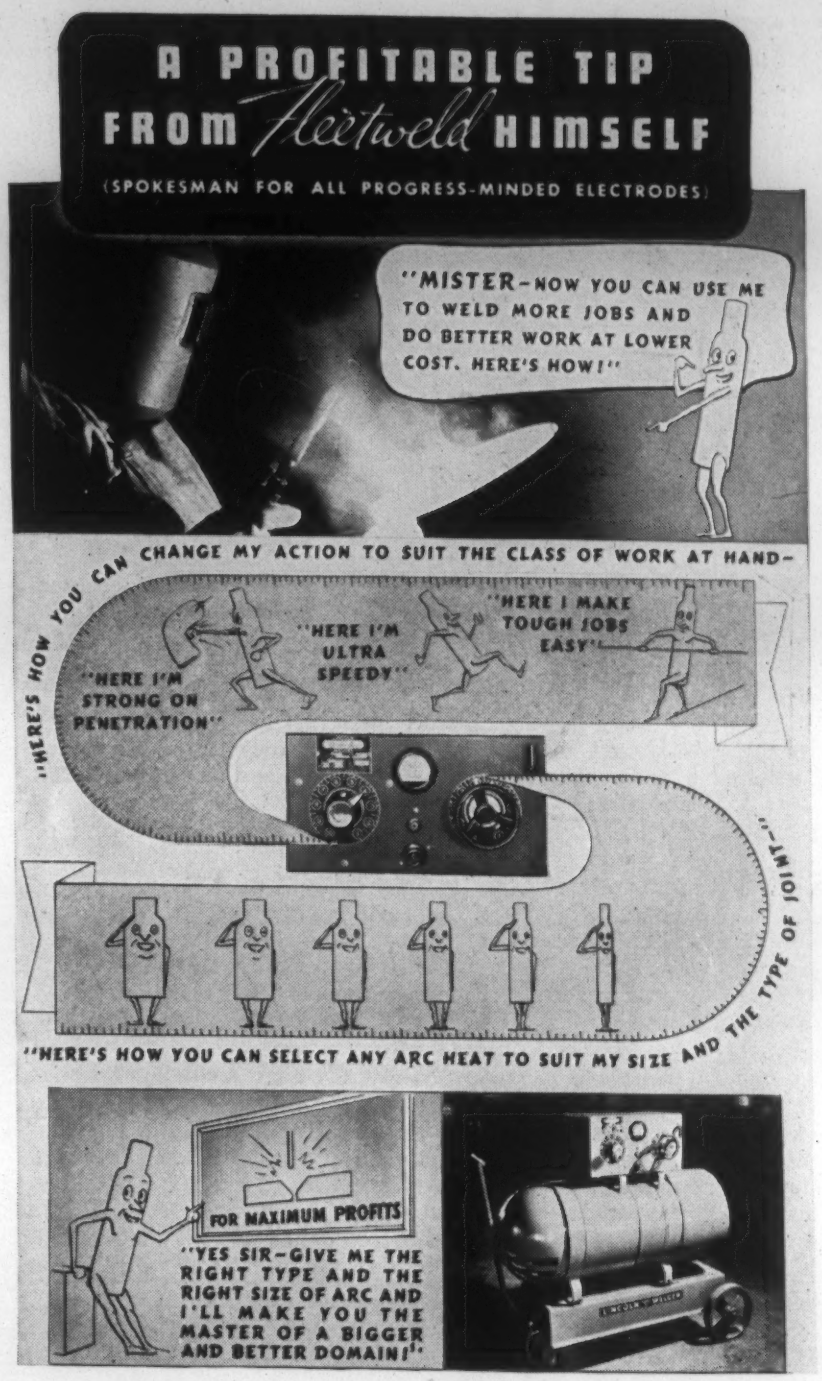
Building Is Cut Apart, Section Removed, Welded Together Again. W. E. ARCHER. *Welding Engr.*, Vol. 21, June 1936, pp 38-39. WB (7b) —

Welding in the Sheet Metal Industry. C. H. S. TUPHOLME *Sheet Metal Ind.*, Vol. 10, Dec. 1936, pp. 967-968. General discussion of applications in the building trade. AWM (7b) — 8

Structural Steel Slides Into the Oil Fields. D. E. VANNESS *Fab. Progress*, Dec. 1936, pp. 138-140. Review of oil well drilling evolution from riveted steel and wooden construction of bull wheel, walking beam, derricks. WB (7b) —

Oxy-acetylene Welding and Cutting in Shipbuilding and Ship Repair. *Trans. Inst. Marine Engrs.*, Vol. 48, Sept. 1936, pp. 257-281. An exhaustive paper prepared by the Brit. Acetylene Assoc. for the 12th Intern. Cong. Acetylene, Oxy-acetylene & Allied Ind., London, June 8-12, 1936. The review is well supported by 62 illustrations. EF (7b) — 9

Qualifying Welders of Silicon Bronze. CHARLES W. REID (Paterson-Kelley Co.). *Welding J.*, N. Y., Vol. 16, Mar. 1937, pp. 5-7. Details of test coupons for tensile (butt and fillet weld) free bend, nick and break tests are tabulated, table given for number of beads and sequence for Everdur 3/16 to 5/8 in. thick welded with d. c. C arc, and procedure control is outlined. WB (7b) — 10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The Principles of Metallurgy Applied to Welding. E. C. HOUSTON. *Welding Ind., London,* Vol. 4, May 1936, pp. 153-160. A general review with experimental data for weld metal, thermally disturbed areas. Physical properties of welds given and hardness surveys for steels of various analyses. WB (7b)

Autogenous Welding of Copper (La Soudure Autogène du Cuivre) P. HOLLARD. *Cuivre et Laiton,* Vol. 10, Feb. 15, 1937, pp. 65-67. Practical. General principles involved, particularly in welding of Cu, are discussed. The best procedure is the semi-progressive whereby the flame is inclined about 45° and moved slightly from right to left; the welding rod should be kept in the molten part continuously. Ha (7b)

Welding Non-ferrous Metals—Some Problems. H. W. G. HIGNETT. *Welding Ind., London,* Vol. 4, Jan. 1937, pp. 460-466; Discussion, Vol. 5, Feb. 1937, pp. 39-43. Good review with some new data and viewpoints in non-ferrous welding. Cost data on welding process are considered of first importance—not only the welding but cost of preparation required. Need for standard test to determine weldability cited and reference made to Portevin index of soundness and uniformity indicates the all-inclusiveness of the term weldability for the welding process and interrelationship with parent metal. Gas absorption and thermal conductivity affect choice of welding method for the material but, with new "Schlauchelektrode," material with high thermal conductivity may be welded without preheat. Interpretation of surveys across the weld made with Chevenard micro-machine, tensometer and hardness tests are considered little more than qualitative until service behavior data are available. Solution of engineering problems of welded joint require more data on mechanical properties of joints; fatigue damping capacity, notch sensitivity, internal stress and distortion. Metallurgical problems might be solved by starting with very pure metals and noting effect of impurities introduced on grain growth at weld boundary, effect of viscosity and surface tension, dissolved gases in parent and rod metal, freezing range of the metal, composition of gas-welding flame (oxidizing, reducing, neutral) physical properties of rods and electrode metal. Problems of human element in selection of material and welding technique and suggested solutions are discussed. Curves are given of H absorption vs. temperature for Ni, Al; ductility vs. temperature for Inconel, Ni, Monel. A micro illustrates stress corrosion cracking near weld in ¼" Ni plate. An ingenious method of determining hot short susceptibility of non-ferrous materials is described in which samples of the materials are bent at elevated temperatures. Photos illustrate the apparatus and some results on Al plate which detected hot short material of poor weldability. See also *Metals and Alloys,* Vol. 7, Oct. 1936, p. MA 499L/3. WB (7b)

Autogenous Cutting of a 20 mm. Thick Boiler Plate M2 (Autogenes Schneiden eines 20 mm. starken Kesselbleches M2) R. DÜMPELMANN (Research Laboratory, I.G.F.) *Autogene Metallbearbeit.,* Vol. 30, Feb. 15, 1937, pp. 49-52. Experiments showed that autogenous cutting did not impair the mechanical properties of the plate. Ha (7b)

Modern Welded Construction—Some Applications of Welding in the Work of the British Thomson-Houston Co., Ltd. Part I. *Welding Ind., London,* Vol. 4, May 1936, pp. 123-128. Discussion of resistance welding, large transformer weld-construction, weld construction of turbine casings, etc. **Part II.** Aug. 1936, pp. 259-262. Manufacture of refrigerator units discussed and described with photos. WB (7b)

Training for Electric Arc Welding. *Welding Ind., London,* Vol. 4, May 1936, pp. 145-147. General. WB (7b)

Layout of Welding Plant for Shipyards. *Welder,* Vol. 9, Jan. 1937, pp. 2-3. A new method of supplying A. C. welding current from motor generator sets to multioperator reactances is described in brief. WB (7b)

Arc Welding in 1936. *Welding Ind., London,* Vol. 5, Feb. 1937, pp. 12-14. Review of welding applications in 1936. WB (7b)

Oxy-acetylene Welding Practices in the Metal Mining Industry. H. R. WASS (St. Joseph Lead Co.) *Intern. Acetylene Assoc.,* Nov. 1936, 8 p. preprint. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 316R/2. WB (7b)

British Industries Fair—Engineering and Hardware Section, Birmingham, Feb. 15-26, 1937. *Welding Ind., London,* Vol. 5, Feb. 1937, pp. 15-22. Description of welding equipment, cutting, profiling machines (gas cutting), number of jigs, etc., photos illustrate some of the equipment. WB (7b)

Welding of Gas Mains—an Unusual Job. *Welding Ind., London,* Vol. 4, Nov. 1936, pp. 362-363. Brief details of steel pipe bending and joining to 12" diam. cast Fe gas main. Three segments are torch cut from pipe on inside of bend, pipe is bent
1 and openings torch welded. WB (7b)

Large Class 1 Welded Pressure Vessels—Evaporators for New Sugar Refinery. *Welding Ind., London,* Vol. 4, Nov. 1936, pp.
— 363-364. Descriptive of equipment and welding procedure. Subsequent local heat treatment of weld practiced with ring burner for circumferential welds and more simply for longitudinal, gas flame impinges on refractory concrete which in turn radiates to
2 weld; thermocouples are placed in weld opposite to side of gas flame. WB (7b)

Electric Arc Welding by the Aid of Direct Current. *Edgar Allen News,* Vol. 15, Mar. 1937, pp. 987-991. The characteristics
— of the direct current arc for welding and British development of arc-welding machines and welded structures are described. Ha (7b)

Manipulator for a Large Blooming Mill—Fabricated Unit to
3 **Handle 11-Ton Ingots.** *Welding Ind., London,* Vol. 4, Aug. 1936, pp. 263-264. Descriptive. WB (7b)

Welding Goes to Market. *Ind. & Welding,* Vol. 10, Feb. 1937,
— pp. 13-15. Welded construction of railroad cars, brief description of details. WB (7b)

High Quality Pipe Welds in Ford's New Power Plant. *Welding Engr.,* Vol. 22, Jan. 1937, pp. 26-29. Illustrated review.
4 WB (7b)

Thermit Process. *Times Trade and Eng.,* Vol. 40, Mar. 1937,
— p. 37. Brief outline. MS (7b)

Employs Oxyacetylene Welding Process in Constructing By-product Plant. *Steel,* Vol. 100, Feb. 22, 1937, pp. 56, 58. Oxy-
5 acetylene cutting and welding were used wherever possible in construction and maintenance of coking plant of Radiant Fuel Corp. MS (7b)

How to Cut Cast Iron. *Oxy-Acetylene Tips,* Vol. 15, Dec.
— 1936, pp. 273-278. Practical. Methods of speedy cutting of cast iron masses in demolition work are reviewed, and equipment is described. Diagrams illustrate the procedure. Ha (7b)

How and Where to Hard Face. *Ind. & Welding,* Vol. 10,
6 Feb. 1937, pp. 16-22, 44. From a bulletin prepared by 1935-36 Oxy-acetylene Committee. Details of procedure and materials for application to various ferrous and non-ferrous materials. General rules, fluxes and thickness of deposit are discussed. Changes in
— procedure for steel are based on C or alloy content and rolled or cast condition. WB (7b)

Qualification Tests Are Important. *Oxy-Acetylene Tips,* Vol.
7 15, July 1936, pp. 149-153. Welding tests for qualifying welding operators are discussed and testing of the examination pieces is described. Ha (7b)

Notes on the Use of the Blowpipe in Railway Maintenance.
— J. ZÜST. *Engineering,* Vol. 141, June 19, 1936, p. 674. Descriptive. VSP (7b)

Arc Welding Structural Alloy Steel. W. L. WARNER. *Ind. &*
8 *Welding,* Vol. 9, Nov. 1936, pp. 61-64; Vol. 10, Jan. 1937, pp. 68-71. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 157 L/5. WB (7b)

Welded Cranes Prove Superiority. WILLIAM G. WEHR. *Ind.*
— *& Welding,* Vol. 9, Nov. 1936, pp. 47-50. Superiority has been found in lower maintenance cost over riveted structures. WB (7b)

Cutting Bit Treatment in Southern Illinois. D. D. WILCOX.
9 *Proc. Illinois Mining Inst.,* 1936, pp. 65-68. Bits are tempered in salt and oil baths. They may be plated with nonabradable material by welding. AHE (7b)

Oxy-cutting of Metals. E. A. WITT. *Welding Ind., London,*
— Vol. 4, Sept. 1936, pp. 313-319. Review with practical data and discussion. WB (7b)

Good Looking Machinery Sells More Easily. L. A. YODER.
10 *Fab. Progress,* Feb. 1937, pp. 28-31. A number of "before and after" photos illustrate advantage of welded plate assembly. Evolution of various types of machines is discussed, new structures favor weight saving, lower cost, combination of steel castings and plate. WB (7b)

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MA 493

The Influence of Nitrogen on the Weldability of Steel. D. SEFERIAN. *Welder,* Vol. 8, July 1936, pp. 1008-1015. Influence of N_2 on mechanical properties and on age hardening is discussed. N_2 content of various Fe and steel products is tabulated and shown to range from .006 to .025%. Bessemer steels contain 2 or 3 times N_2 content of open-hearth steels. Study of Fe-N system with dilatometer led to results differing from those of Fry (*Stahl und Eisen,* Vol. 63, 1923, p. 1). At 590° C. solubility limit of N_2 in α Fe is .14% whereas Fry determined it as .50% at 580° C. Steels with .010% to .025% N are solid solutions in α and age hardening can easily take place. Gradual increase in elastic limit and tensile strength occurs for Thomas steel with increasing N from .015 to .025% while ductility shows a steep drop; thus deformation resistance properties increase and deformation capacity properties decrease with increasing N. Thermal analysis with dilatometer of Armco Fe and Armco Fe with .14% and .20% N obtained by melting in electric arc shows precipitation of N to start at 300° C. N-martensite quenched from α and γ is harder than N-austenite, quenched from γ region; structural hardening due to tempering starting from the α and γ range is greater than that resulting from hypertempering; impact drops rapidly with N content and aging time. The study of N precipitation was applied to investigation of cause of cracking of Thomas steel welded vessels. The vessels cracked parallel to weld at a distance from the bead which increased with the thickness of the plate welded. Measurements with thermocouple showed the region to attain max. temperature of 320° C. during welding and micros of sections in this zone showed precipitation of Fe_4N. The tensile strength, elastic limit and elongation are tabulated for parent metal, parent metal heated to 320° C. slow cooled, 320° C. water quenched, 750° C. air cooled. 750° C. water quenched. Results were obtained with micro-shear specimens in Chevenard micromechanical machine and show approximate progressive increase in tensile and elastic properties and decrease in ductility in the order named above except that 320° C. slow cooled sample showed lowest mechanical properties and highest ductility. The micrographs of all samples showed α solid solution except the 320° C. slow cooled which showed Fe_4N. WB (7b)

Arc-welded Design of Water Line Y and Reducer Permits Reinforcement. F. G. SHERBONDY. *Steel,* Vol. 100, Feb. 15, 1937, pp. 52, 56. Describes design and construction of section from ½-in. steel plate. MS (7b)

Why Should Piping Contractors Recommend Welding to Architects and Engineers? SHERMAN T. SIELEY. *Welding Engr.,* Vol. 21, Dec. 1936, pp. 33-37. Evolution of pipe line jointing to modern weld-jointing. Advantages are detailed. WB (7b)

Electric Resistance Welding—the German Patent Position WERNER SIMON. *Welding Ind., London,* Vol. 4, Dec. 1936, pp. 407-412. Review of existing German patents dealing with diminution of inductive losses, their importance and the means adopted in practice. WB (7b)

Visual Inspection of Welding. E. W. P. SMITH (Lincoln Electric Co.) *Welding Engr.,* Vol. 22, Feb. 1937, pp. 37-39. Review of good and poor welding conditions and practical means to diagnose the results obtained. WB (7b)

A Metallurgical Study of Welding. T. SWINDEN. *Welding Ind., London,* Vol. 4, Dec. 1936, pp. 427-435. *Iron Steel Ind.,* Vol. 10, Dec. 1936, pp. 202-206. *Sheet Metal Ind.,* Vol. 10, Dec. 1936, pp. 965-966. *Iron & Coal Trades Rev.,* Vol. 133, Nov. 20, 1936, pp. 893-894. Thorough review. Gases, deoxidation in ingots, solidification are considered in relation to sound welds. O in weld deposit is dependent on electrode coating; Quench aging results indicate C content has controlling effect; thorough deoxidation is requirement for high impact (non-aging) but this also produces small grain size. The question is, which is responsible, grain size or deoxidation? Strain-age-embrittlement is discussed with data from the literature, and cracking and stresses are shown possibly to be related to Mn, Si, S content of weld metal. Dilation on freezing of deposits is considered of possible effect on cracking and relevant data from Steel Castings Research Committee are presented and discussed. Fatigue tests appear to be most useful in determining quality of weld.
WB + CEJ + AWM + Ha (7b)

Obtaining Sound Welds of Neat Appearance. J. E. MINTY. *Welder,* Vol. 9, Jan. 1937, pp. 26-28. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 154L/5. WB (7b)

Alloy Steels for Welded Power Piping. J. R. DAWSON. *Heating, Piping, Air Conditioning,* Vol. 8, Aug. 1936, pp. 435-437. **Welded Alloy Steel Power Piping is finding more Extensive Application.** *Steel,* Vol. 98, May 4, 1936, pp. 48, 66. See *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 535 R/7. MS + CBJ (7b)

1 **Hard-facing vs. Plastering.** MILES C. SMITH. *Welding Engr.,* Vol. 22, Feb. 1937, pp. 25-27. Descriptive. Failure of hard facing due to ignorance of factors which when understood have led to successful application with skilled welder. Parent metal composition, relative coefficient of expansion, bond produced, etc., are factors in successful hard-facing. Better control of overlay obtained with gas torch than with d.c. metallic arc welding. WB (7b)

— **The Arc Welding of Light Sheet Steel.** H. THOMASSON (Can. West. Co. Ltd.) *Iron & Steel Can.,* Vol. 19, Oct. 1936, pp. 5-8.

2 Up-to-date review of practical developments. Principles of a.c. arc-welding are explained and welding procedures and preparation of sheets of different gages for welding are described. Today, butt welding is the preferred method for sheets. Ha (7b)

— **Shape Cutting in the Production of Heavy-duty Dirt Equipment.** R. G. LE TOURNEAU. *Intern. Acetylene Assoc.,* Nov. 1936, 6 p. preprint. Competition of welding and casting is considered to extend to production of large amount of duplicate equipment since shapes can then be cut with automatic equipment. Ad-

3 vantage in welding is that expensive metal can be placed where needed for service and in small amounts whereas casting and forging are one piece construction. The plant of the author has discarded steel castings entirely in favor of welded fabrication using rolled sections and plate. WB (7b)

— **Unusual Type of Caisson Devised to Realign and Strengthen Bridge Pier.** HENRY W. YOUNG. *Steel,* Vol. 100, Mar. 15, 1937,

4 p. 76. Describes work done on Columbia River highway bridge near Grand Coulee, Wash. Electric welding was used for joining steel piling and in fabricating rings from I-beams. MS (7b)

— **Spot Welding Problems.** J. H. ZIMMERMAN. *Welding Ind., London,* Vol. 4, Feb. 1936, pp. 13-18. See *Metals and Alloys,* Vol. 7, May 1936, p. MA 240R/4. WB (7b)

5 **Welding in the Construction of the Plant for the Galloway Water Power Scheme.** *Welder,* Vol. 9, Jan. 1937, pp. 22-25. Details of the turbines and electrical equipment. WB (7b)

— **Second Report of the Welding Research Committee of the Institution of Mechanical Engineers.** *Welding Ind., London,* Vol. 4, May 1936, pp. 135-139. *Welding J., N. Y.,* Vol. 16, Feb. 1937, p. 15. *Electrical Rev.,* Vol. 118, May 1, 1936, p. 639. *Engineering,* Vol. 141, May 1, 1936, pp. 492-494; May 15, pp. 544-546.

6 WB + MS + VSP (7b)

Railway Welding Problems—Conference at Cricklewood. *Welding Ind., London,* Vol. 4, Nov. 1936, pp. 380-382. Discussion at the conference is given, mostly on welding of Cu. WB (7b)

— **Welding Locomotive Cylinders and Frames—Railway Engineers' Conference at Cricklewood.** *Welding Ind., London,* Vol. 4,

7 Jan. 1937, pp. 455-458. Report of discussion at conference on American and British practice regarding repair of cylinders with cast Fe or bronze rods, welding of piston heads, building up cylinder, welding of frame. WB (7b)

— **Jigs and Fixtures.** *Welding Ind., London,* Vol. 4, Sept., 1936, pp. 299-306. See *Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 588R/5. WB (7b)

8 **Fleetwings Welds All-metal Planes.** F. H. COLVIN (Staff). *Am. Machinist,* Vol. 81, Mar. 10, 1937, pp. 205-206. Thin strips of stainless steel of 0.010-0.014 in. are spot-welded to form a stiff body member. Process described in detail. Ha (7b)

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7c. Riveting

9 **Riveting of Aluminum and its Alloys.** *Aero Digest,* Apr. 1937, pp. 44-46. A review of design and fabricating practice for joints riveted with aluminum alloy rivets of several compositions. 53S (Al containing 1.25% Mg, 0.7% Si and 0.25% Cr) rivets are recommended for Alclad materials and 52S. (The safe shear

— design stresses which are recommended are approximately 15% higher than the values used in the aeronautical industry. J. B. J.) JBJ (7c)

10 **New Construction Process Eliminates Visible Joints, Bolts and Rivets.** *Steel,* Vol. 100, Mar. 1, 1937, p. 50. Describes new fastening method devised by Ernest Schaefer, Cleveland. Main feature of construction, known as Permagrip, is a special bolt which holds a thin sheet of metal over a backing of plywood. MS (7c)

8. FINISHING

H. S. RAWDON, SECTION EDITOR

Industrial Trends Influence Changes in Three Magnet Wire Standards. M. A. KENT (General Cable Corp.). *Wire & Wire Prod.*, Vol. 12, Mar. 1937, pp. 129-131. Some advisable changes, particularly in treating and finishing enameled wires, are discussed. Ha (8)

Anti-corrosion Treatment; Wide Variety of Method. J. F. CROWLEY. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 32. Describes methods of protecting Al and its alloys by anodic oxidation, chemical treatment, electroplating, metal spraying, and application of paints, varnishes, lacquers, and enamels. MS (8)

8a. Pickling

Acid Proof Brick Joined with Sulphur Cement Protects Concrete and Steel. C. R. PAYNE. *Steel*, Vol. 100, Feb. 15, 1937, p. 73. Descriptive, Tanks for acids and corrosive salt solutions are protected by sheathing of S-cement joined masonry. MS (8a)

Anodic Pickling of Iron and Steel. R. MÜLLER & L. HARANT. *Iron Age*, Vol. 137, Apr. 30, 1936, pp. 42-43. See *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 220L/5. MS (8a)

Roller Conveyors Facilitate Handling Hot Strip Steel at Pickling Station. *Steel*, Vol. 100, Mar. 22, 1937, p. 60. Descriptive. MS (8a)

Apparatus to Demonstrate the Protective Effect of Inhibitors (Apparat zur Veranschaulichung der Schutzwirkung von Beizzusätzen). O. VOGEL. *Korrosion u. Metallschutz*, Vol. 13, Jan./Feb. 1937, pp. 40-41. Descriptive. A projection arrangement shows on a screen the action of the pickling acid before and after adding the inhibitor. Ha (8a)

General Remarks on Pickling before Galvanizing (Allgemeine Bemerkungen zum Beizen vor dem Verzinken) H. BABLIK. *Korrosion u. Metallschutz*, Vol. 13, Jan./Feb. 1937, pp. 34-40. The nature of pickling requires a distinction between the types of scale to be removed, as rolling scale and annealing scale react differently during the pickling process. Scale-forming conditions and theories are discussed, and formulas given for calculating the effects of oxidation. From the practical viewpoint the undesirable effects of scale and of non-uniform pickling, surface defects and H_2 diffusion on the pickling process are discussed. 19 references. Ha (8a)

8b. Cleaning including Sand Blasting

Cleaning and Finishing Pressed Metal Products. MICHAEL FORCHIONE. *Ind. Finishing*, Vol. 12, Oct. 1936, pp. 43-44. Practical. Pressed metal products are cleaned in naphtha and later baked to remove all naphtha and grease. The method for finishing after cleaning used at the plant of Berger Mfg. Co. is described. VSP (8b)

8c. Polishing & Grinding

Wheels for Carbide Tools. E. T. LARSON (Norton Co.). *Am. Machinist*, Vol. 81, Apr. 7, 1937, pp. 284-285. Review. The abrasives used on wheels for grinding cemented carbide tools are diamond or silicon-carbides. A table shows the grade, grain size and bond to be used for different grinding operations. Ha (8c)

Use of Abrasives with Copper and Its Alloys (Le Travail du Cuivre et des ses Alliages par les Abrasifs) A. CHAPLET. *Cuivre et Laiton*, Vol. 9, Dec. 30, 1936, pp. 555-561. General. Natural and artificial abrasives, their structural properties, the work for which they are best suited, and necessary equipment, are described.

Polishing & Buffing of Stainless Steels. R. S. LEATHER. *Metal Cleaning Finishing*, Vol. 7, Sept. 1935, pp. 437-442. Practical. Retention of luster on polished stainless steel is improved if surface is free from foreign particles (especially Fe), scratches, and pits. Polishing abrasive must be Fe free, hence artificial abrasives are preferred to emery. Each polishing operation should be at right angles to previous one in order that scratches be reduced rather than cut deeper. Buffs which have been used for brass or steel should not be used for stainless. For flat work, C. C. Snyder (Republic Steel Corp.) recommends 80 dry wheel to 100 or 120 grease wheel; then 150 and 180 set up wheels followed by 220 grease and flour emery. Artificial abrasives recommended up to 180 black emery for finer wheels. Wheel speeds are 6500 to 8000 ft./min. for polishing; 8500-12,000 for buffing. A tampico wheel with 120 grit gives a pleasing smooth gray luster as a final commercial finish. A paste to use with tampico is made of 1 part kerosene, 4 parts F pumice, 1 part lime, 4 parts engine oil. Overheating in buffing is to be avoided; ventilated buffs or wheel sections spaced with cardboard are recommended. For buffing composition, green Cr oxide is suitable. Fe oxide (rouge) is not recommended. A good satin finish is produced by a greaseless composition. 21 references. See also *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 159 R/7. GBH (8c)

Grinding Skin and Retention of Cutting Edge of Ground Parts (Schleifhaut und Schneidhaltigkeit der geschliffenen Teile) F. RAPATZ. *Stahl u. Eisen*, Vol. 57, Mar. 4, 1937, pp. 250-252. Practical. Grinding hardened steel frequently softens the surface to a depth of about 2 to 3 mm. because of the heat produced in grinding. This effect is particularly noticeable in carburized steel and in alloy steel but not in high speed steel. Steel with such a skin loses its cutting edge and wears very rapidly. Internal stresses also arise in the soft skin which may cause cracking. The stresses can be removed by tempering at 600° C. SE (8c)

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8d. Electroplating

Electrolytic Surface Treatment of Aluminum and Its Alloys (Fragen zur elektrolytischen Oberflächenbehandlung von Aluminium und Aluminium-Legierungen) *Korrosion u. Metallshutz,* Vol. 12, Oct. 1936. **I. Prerequisites and Principles for the Surface Treatment of Aluminum. Importance and Application of the Different Processes (Voraussetzungen und Grundlagen für die Oberflächenbehandlung von Aluminium. Die Bedeutung und Anwendung der verschiedenen Verfahren)** F. NÜCKEL, pp. 283-290; **II. Explanation of the Technical Factors in the Eloxal and Elytal Processes, and Discussion of the most Important Practical Points (Begründung der technologischen Bedingungen für die Eloxal- und Elytal-Verfahren, sowie Erörterung der für die Praxis wichtigstens Gesichtspunkte)** W. BIRETT, pp. 290-297. Unusually comprehensive review. Ha (8d)

Preliminary Treatment for the Electroplating of Aluminum and Aluminum Alloys (Vorbereitungsverfahren für die Elektroplattierung von Aluminium und Aluminiumlegierungen) HUGO KRAUSE (Schwäbisch-Gmünd) *Metallwirtschaft,* Vol. 16, Feb. 12, 1937, pp. 162-164. Descriptive. GA (8d)

Electrochemist Reviews Progress in Electroplating Industry During 1936. C. B. F. YOUNG. *Steel,* Vol. 100, Jan. 18, 1937, p. 54. Review of recent developments. Key-note has been production of smooth, thick, bright deposits without buffing. Anodizing of Al has been improved by using a solution of Na_2CO_3 and Na_3PO_4 and then a solution of $NaHSO_4$. Alloying of Co and Ni for finishes is attaining wide popularity. New strike solution for depositing Cu on Fe contains $CuSO_4$, Na oxalate, and triethanolamine. Codeposition of Ni, Cu, Zn, and Au gives Au color with wearing quality of steel. Sn-plate manufacture by electroplating has reached commercial stage. Zn continues to increase in popularity. New electrolytic method of producing colored finishes is expected to be introduced shortly. MS (8d)

Future of Eletctrodeposition. H. J. T. ELLINGHAM. *Electrical Rev.,* Vol. 119, Sept. 25, 1936, p. 405. Survey, with forecast. MS (8d)

Development of Control in Electrodeposition Processes. A. W. HOTHERSALL. *Chem. Trade J.,* Vol. 99, Sept. 18, 1936, p. 237. *Electrical Rev.,* Vol. 119, Sept. 25, 1936, p. 405. *Sheet Metal Ind.,* Vol. 10, Oct. 1936, pp. 791-792. **(Neuere Entwicklung der Galvanotechnik in England)** *Oberflächentech.,* Vol. 13, Sept. 1, 1936, pp. 197-198. See *Metals and Alloys,* Vol. 7, Nov. 1936, pp. 115-120. MS + AWM + Ha (8d)

Electroplating of Aluminum. V. I. LAINER & S. I. ORLOVA. *Aluminium Non-ferrous Rev.,* Vol. 1, May 1936, pp. 381-383. See *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 538R/3. JCC (8d)

Use of Cobalt-nickel Solutions to Produce Bright Electrodeposits. L. WEISBERG. *Iron & Coal Trades Rev.,* Vol. 133, July 31, 1936, p. 181. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 160R/8. Ha (8d)

A New Method of Measuring Electroplates. W. BLUM & A. BRENNER. *Metal Ind.,* New York, Vol. 34, July 1936, pp. 258-260. See "Mesle's Chord Method for Measuring the Thickness of Metal Coatings," *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 537R/4. CBJ (8d)

Anodic Coating of Aluminum. *Can. Chem. Met.,* Vol. 21, Feb. 1937, pp. 51-52. Descriptive. Clear and colored coatings, and the Alzac process for the production of reflectors are discussed. WHB (8d)

Modern Filtration Practice. F. D. PACE. *Metal Cleaning Finishing,* Vol. 8, May 1936, pp. 233-238. See *Metals and Alloys,* Vol. 7, July 1936, p. MA 356R/8. GBH (8d)

The Testing of Electrodeposited Coatings. L. C. BANNISTER. *Metal Cleaning Finishing,* Vol. 7, Nov. 1935, pp. 539-542. See *Metals and Alloys,* Vol. 7, Mar. 1936, p. MA 134L/10. GBH (8d)

The Electrolytic Deposition of Bivalent Ytterbium (Die elektrolytische Abscheidung des zweiwertigen Ytterbiums) A. BRUKL. *Angew. Chem.,* Vol. 50, Jan. 2, 1937, pp. 25-29. Pure Yb could easily be produced by electrolysis from Ytterbium-II-sulphates; the separation from the associated elements is described. Ha (8d)

8e. Metallic Coatings other than Electroplating

1 **Lead Coating of Steel.** J. L. BRAY (Mass. Inst. Tech.) *Metals Tech.,* Vol. 4, Feb. 1937, T.P. 788, 8 pp. Original research. Steel sheets were first coated with Zn electrolytically and then coated with Pb by hot dipping. If the Pb bath contained a small amount of Zn and the temperature and other conditions were within narrow limits a smooth continuous coating of Pb resulted. Function of the Zn is discussed. Accelerated tests indicated good corrosion resistance. Some new data on the Pb end of the Pb-Zn diagram are given. JLG (8e)

2 **Artificial Oxide Films Improve the Durability of Paint on Light Metals (Künstliche Oxydschichten verbessern die Haltbarkeit von Farbüberzügen auf Leichtmetall)** W. NICOLINI. *Aluminium,* Vol. 19, Jan. 1937, pp. 4-5. Practical. If painting Al it is advantageous to oxidize electrolytically the material, previous to painting, by either the eloxal (oxalic acid) or the MBV (Na chromate) process. These oxide layers should be porous to improve the adhesion of the paint. Ha (8e)

3 **Rust Proofing Iron and Steel By Metallizing.** *Iron Age,* Vol. 139, Feb. 11, 1937, pp. 54-G—54-H, 82. Practical description of method and equipment recently adopted by Lathrop-Paulson Co., Chicago, for metallizing milk can washing machinery and conveyors. VSP (8e)

8f. Non-Metallic Coatings

4 **Bituminous Coatings for Steel Pipe.** R. W. PARKHURST. *Commonwealth Engr.,* Vol. 24, Nov. 2, 1936, pp. 125-133. Comprehensive review based on 24 international references and author's own experience. Although protection of steel pipes by tar and bituminous materials from the corrosive action of the water carried and of the surrounding soil has been practiced for many decades, the ideal covering is as yet undiscovered. With respect to tar compounds, an important factor is the alteration that has taken place in the composition of the tar with developments in methods of gas and by-product manufacture. Modern tars are not so suitable for pipe protection as were those of 50 years ago. Test results and field experience (A.G.A., A.P.I.) are discussed at length. EF (8f)

5 **Rust Protection Problems and Rust Protection Technique (Om rostskyddsproblem och rostskyddsteknik)** STURE SABELSTRÖM. *Tek. Tid.,* Vol. 67, Apr. 24, 1937, Section *Väg- och Vattenbyggnadskonst*) pp. 37-41. A general discussion of the most important paints used in rustproofing Fe. The question of having a clean Fe surface is of paramount importance, for which sand blasting, subsequent to controlled rusting, is recommended. BHS (8f)

6 **Chemically Treated Galvanized Sheets Retain Paint and Resist Corrosion.** *Steel,* Vol. 100, Jan. 18, 1937, p. 51. Descriptive. MS (8f)

7 **Porcelain Enamel Protects Cast Iron Pumps Against Corrosion, Sand Wear.** *Steel,* Vol. 100, Feb. 8, 1937, pp. 52, 54. Descriptive. Impellers and bowls of deep-well pumps are enameled. Increased efficiency and life of pumps is claimed. MS (8f)

8 **Progress in the Field of Coatings for Light Metals as Reflected in the Latest Patent Literature (Fortschritte der Leichtmetalloberflächentecknik an Hand der neuesten Patentliteratur).** K. NISCHK (German Gov., adviser) *Leichtmetall,* Feb. 15, 1937, pp. 17-19. Review of recent patents. A variety of protective coatings on the light metals are used for appearance, corrosion resistance and as a basis for coloring. The oxide coating on Al, Mg, Ta, and Be may be formed either by anodic treatment or by chemical treatment without an external electric current. Several patented compositions of baths are given. Lately a fluoride coating has been anodically formed on Mg. A protective coating of Zn, Pb, or Ag may be galvanically deposited. Processes for forming Al coatings on other metals such as Fe from molten Al salt baths have not yet succeeded in producing an adherent coating. An Al coating may also be desirable on Al alloys. JZB (8f)

9

10 **Every Finishing Specification Is a Special Problem.** G. KLINKENSTEIN (Maas & Waldstein Co.) *Product Eng.,* Vol. 8, Mar. 1937, pp. 82-84. The necessity of choosing a type of lacquer suitable for the type of raw material, character of surface, service, and nature of atmosphere to which it is exposed, is emphasized; present status of finishing processing is discussed. Ha (8f)

9. TESTING

The Determination of Non-metallic Inclusions in Steel and Iron. E. W. COLBECK, S. W. CRAVEN & W. MURRAY. *Engineer,* Vol. 162, Nov. 13, 1936, p. 515. Includes discussion. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 205L/9. LFM (9)

Methods for Testing Metals. "CANTAB." *Welder,* Vol. 8, Nov. 1936, pp. 1137-1140. A "not altogether flippant treatment" of what the metals tester needs. Suggestion is made for impact hydraulic test, simultaneous recording of stress, strain, and time as independent values during tensile testing. Metallurgists should determine volume changes during the tensile tests; large scale projection of the shadow of holes in plates might be used to determine stress-strain relationships. Author seeks a magnetic detector which can screen out unit effects of composition, heat treatment, etc., and thus find where "young and healthy" metal has become fatigued, etc., enough to be eligible for the "Old Age Pension." WB (9)

Newer Metallographic Microscopes (Nyare Metallmikroskop) GÖSTA ERICSON. *Tek. Tid.,* Vol. 67, Apr. 10, 1937, (Section *Bergsvetenskap*), pp. 25-31. A well illustrated description of the latest types of metallographic microscopes, including Busch, Reichert, Zeiss, and Leitz models. Contains some historical data and theoretical discussion. BHS (9)

Purpose and Shape of Glass Apparatus Commonly Used in the Laboratory (Zweck und Form der gebräuchlicksten, allgemein Laboratoriumglasgeräte). *Glas u. App.,* Vol. 17, Aug. 30, 1936, pp. 157-159; Sept, 13, 1936, pp. 167-169; Sept. 27, 1936, pp. 177-179; Oct. 11, 1936, pp. 189-191. Exhaustive review and description of apparatus used in modern metallurgical, chemical, ceramic and physical laboratories. Ha (9)

9a. Inspection & Defects, including X-Ray Inspection

C. S. BARRETT, SECTION EDITOR

Causes of Formation of Flakes in Alloy Steels. N. BEZMELNITSYN & V. IVANCHENKO. *Stal,* Vol. 6, Apr. 1936, pp. 60-69. In Russian. Practical. Slow cooling after rolling was the only means found to prevent flakes in 110 mm. blooms of 5140 and 3312 steel. HWR (9a)

X-ray Testing of Welds. R. BERTHOLD. *Engineering,* Vol. 141, June 19, 1936, pp. 673-674. See *Metals and Alloys,* Vol. 7, Apr. 1936, p. MA 198R/1. VSP (9a)

Testing Oxy-acetylene Welds by X-rays. L. C. PERCIVAL & C. COULSON SMITH. *Mech. World Eng. Record,* Vol. 100, Aug. 7, 1936, pp. 123-124, 126; *Engineering,* Vol. 141, June 19, 1936, p. 674. *Welding Ind., London,* Vol. 4, June 1936, pp. 180-187. Presented before the 12th Int. Cong. Acetylene, Oxy-Acetylene Welding, and Allied Industries. A completely welded container typical, in its details, of much modern industrial practice was cut up and each portion of weld examined radiographically. Boiler, apparatus, and radiographs are shown in 17 illustrations and interpreted. WH + VSP + WB (9a)

Testing Materials by X-ray Examination (Materialprovning med röntgengenomstraalning) HAAKON SWEDENBORG, *Tek. Tid.,* Vol. 67, Mar. 13, 1937, pp. 93-99. Describes the commonly used apparatus and methods for examining welds, castings, boilers, high-pressure vessels, structural members, wire rope, and bearings. BHS (9a)

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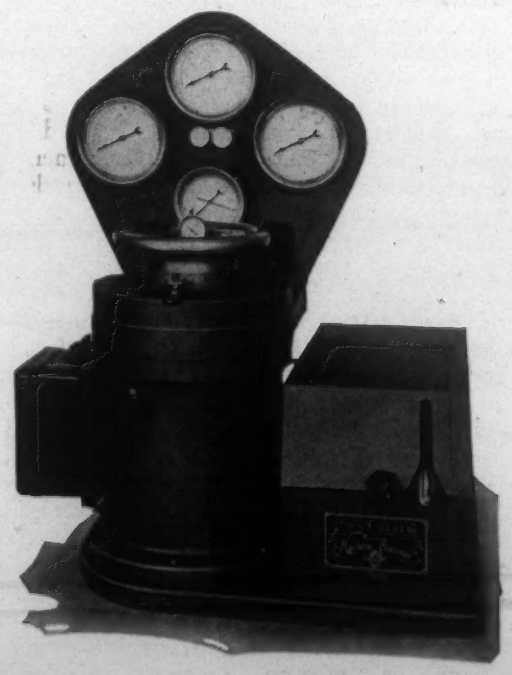

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9b. Physical & Mechanical Testing

W. A. TUCKER, SECTION EDITOR

The Relation of Mechanical Testing to Steel Performance. WM. HOWARD CLAPP (Calif. Inst. Tech.). *Preprint Am. Petroleum Inst.*, Chicago, Nov. 1936, 8 pp. *Steel*, Vol. 100, Feb. 22, 1937, pp. 38-41, 74. *Heat Treating Forging*, Vol. 23, Mar. 1937, pp. 132-136. The extent to which the mechanical properties of steel, as determined by the standard laboratory tests, are actual measures of steel performance in service is discussed. The author discourages the tendency of steel salesmen to emphasize the superior mechanical properties of their brands of machinery steel. The various mechanical properties of a large number of these alloy steels are compared; and it is shown that the differences in average values of any one property, such as yield point, is much less than the variation from average which may occur in any one type of steel. The uncertainty regarding the physical factors which determine yielding is discussed. Four different types of steel failure are recognized: (a) the ductile type of failure, brought about by an overload, (b) the brittle type of failure, which takes place because of sudden shock (impact), (c) the progressive type of failure, which occurs when material is subjected to variations in stress and usually after a large number of repetitions of stress (fatigue), and (d) the exceedingly slow but continuous stretch of steel under load at high temperatures (creep). The mechanical properties of the steel give us an incomplete picture of each type of failure. Finally, the author makes a plea for a rating of the various steels on a basis of dependability in which a high coefficient of dependability would correspond to a narrow range of variation in some particular property after the steel has been heat-treated to give a desired value of that property. VVK + MS (9b)

Significance of Mechanical Tests for the Engineer (Bedeutung der Ergebnisse der Werkstoffprüfung für den Konstrukteur) E. SIEBEL. *Stahl u. Eisen*, Vol. 57, Feb. 25, 1937, pp. 196-202. The various types of mechanical tests are discussed. Besides the tensile test, the 180° bend and repeated bend test of bars, flattening tests of bars and tubes, spreading tests of rings and tubes, punching tests, twisting tests, and cupping tests are mentioned and their significance indicated. SE (9b)

The Present Status of Testing Deep Drawing Sheets (Der gegenwärtige Stand des Prüfens von Tiefziehblechen) OTTO ANDRIEU. *Kalt-Walz-Welt*, Apr. 1937, pp. 23-27; May 1937, pp. 29-34. Comprehensive critical resumé of the methods of testing deep drawing sheets. The opinions of experts on value and qualification of the various known testing methods are divided; an ideal testing apparatus is still undeveloped, and sheet producer and consumer are forced to predict the practical behavior of sheets in actual drawing operations from the results of certain approximate testing methods. What is commonly understood by "drawing quality" is not always the deep drawing quality. The deformation process is so complex that it cannot be simulated by a simple testing method. Therefore the paper distinguishes between deep drawing as a property of a single deformation and "cold plasticity" as a property of repeated deformations. The modern deep drawing testing apparatus possesses the disadvantage that it does not truly imitate the flow of material in practical deep drawing. Their acknowledged advantage is quick and handy testing procedure. The methods developed in Germany in recent years are reviewed, as the Erichsen special cupping test, the cupping tensile test by Siebel & Pomp, the hole-widening test by Siebel & Pomp, the AEG test by Fischer, the testing method of Schmidt, the wedge drawing test of Sachs and others. In general the efforts to introduce the common characteristic mechanical properties of steel, as tensile strength, elongation, hardness, etc., for judging deep drawing properties have made little headway. However, the foregoing methods permit excellent prediction of the behavior of sheets in actual deep drawing operations. In conjunction with all deep drawing testing methods, appearance of fracture of cup and course of power applied should be considered. [The practical value of certain of the modern simulated tests is questionable. An unfortunate omission from the paper was the wedge drawing-cupping test developed by the Kohle und Eisenforschung Inst., Dortmund. G.N.] GN (9b)

The Relationship between Mechanical Tests of Materials and their Suitability for Specific Working Conditions. N. P. INGLIS. *Iron & Coal Trades Rev.*, Vol. 133, Dec. 25, 1936, pp. 1095-1096; Vol. 134, Jan. 1, 1937, pp. 3-4. *Blast Furnace Steel Plant*, Vol. 25, Jan. 1937, pp. 119, 131; Feb. 1937, pp. 217-218. *Mech. World Eng. Record*, Vol. 101, Feb. 26, 1937, pp. 213-214, 230; Mar. 5, 1937, pp. 245-246; Mar. 19, 1937, pp. 239-294, 302. General discussion. The various requirements usually embodied in a purchasing specification for an important steel forging are discussed. The specification tests in themselves do not ensure suitability for a particular set of working conditions. Further information, derived from the special tests described or from previous experience, is necessary in conjunction with the specification tests. Ha + MS + EF (9b)

The Determination of Young's Modulus by Flexural Vibration. G. GRIME & J. E. EATON. *Phil. Mag.*, Vol. 23, Jan. 1937, pp. 96-99. Original research. A method is described by which a specimen of a material for which the determination of changes of length is troublesome, is supported on two pads of sponge rubber and brought to natural vibration. A table is given for some materials; e.g. for Pb the modulus at 18° C. is 2.63×10^6, paraffin wax 0.27×10^6, rock asphalt 0.09×10^6 lb./in.^{2} See also *Metals and Alloys*, Vol. 6, Dec. 1935, p. MA 501L/8. Ha (9b)

Wire Ropes Research. *Engineering*, Vol. 141, Jan. 3, 1936, pp. 25-26. See *Metals and Alloys*, Vol. 8, Jan. 1937, p. MA 29L/8. LFM (9b)

Automatic Temperature Control (Controle Automatique des Températures) L. VAN DEVOIR. *Usine*, Vol. 46, Jan. 1, 1937, pp. 35-39. Methods and instruments used, and equipment applied to furnaces, are discussed. Ha (9b)

Testing Materials. *Automobile Eng.*, Vol. 26, Dec. 1936, pp. 521-522. Reviews developments in the use of ultraviolet rays for testing materials, and explains the physical principles involved. Ha (9b)

Creep Characteristics of Metals. *Metal Treatment*, Vol. 2, Winter 1936, pp. 201-204. Summary of papers presented at the 1936 Convention of the Am. Soc. Metals. JCC (9b)

An Improved Method for Preparing Cast-iron Transverse Test Bars. A. I. KRYNITSKY & C. M. SAEGER, JR. (Nat. Bur. Standards.) *Am. Foundrymen's Assoc.*, Preprint 37-5, 1937, 20 pp. See *Metals and Alloys*, Vol. 7, Sept. 1936, p. Ma 457L/4. CMS (9b)

A New Dilatometer for Thermal Analyses (Ein neues Dilatometer für thermische Metallanalysen) A. METZ. *Giesserei*, Vol. 23, Aug. 28, 1936, pages 437-439. Descriptive. Ha (9b)

9c. Fatigue Testing

H. F. MOORE, SECTION EDITOR

The abstracts appearing under this heading are prepared in co-operation with the A.S.T.M. Research Committee on Fatigue of Metals. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor.

Endurance Limit of Forged Steel Crank Shafts and Means for Its Improvement (Dauerhaltbarkeit geschmiedeter Stahlkurbelwellen und Mittel zu ihrer Steigerung) A. THUM & K. BANDOW. *Automobiltech. Z.*, Vol. 40, Jan. 25, 1937, pp. 29-33. Original research. The high stresses in modern crankshafts of internal combustion engines lead to two kinds of crankshaft failures: torsion fatigue failures and bending fatigue failures. Endurance limit is favorably affected by rounding of the transition from the crank to the jaw, and a definite relation was found between radius and fatigue strength. A number of tests with crankshafts of different shapes and different steels are described; two possible means of increasing the endurance limit are improvement of design to reduce the notch effect, and cold-working or surface hardening of critical zones. Methods are compared. 9 references. Ha (9c)

Surface Conditions and the Fatigue Resistance of Steels. G. A. HANKINS, M. L. BECKER & H. R. MILLS. *Engineer*, Vol. 161, May 22, 1936, pp. 553-554. *Heat Treating, Forging*, Vol. 22, July 1936, pp. 340-345; Aug. 1936, pp. 394-399. See *Metals and Alloys*, Vol. 7, Dec. 1936, p. MA 598R/1. VSP + MS (9c)

A New Fatigue Testing and Damping Testing Machine (Eine neue Schwingungs- und Dämpfungsprüfmaschine). OTTO HOLTSCHMIDT. *Montan. Rundschau*, Vol. 28, Aug. 16, 1936, (Section *Stahlbau-Tech.*) pp. 1-3. A new testing machine has been designed for torsional vibration and repeated bending stresses. The fatigue resistance can be determined according to the Wöhler method or by the method of Esau and Kortum. (See *Metals and Alloys*, Vol. 5, Apr. 1934, p. MA 148.) The damping is obtained directly, with practically no loss of time, regardless of the method used in determining the fatigue resistance. The machine can also be used for testing valve plates. BHS (9c)

9d. Magnetic Testing

L. S. REID, SECTION EDITOR

A Single Strip, Core-Loss Tester for Electrical Sheets. B. M. SMITH (General Electric Co.) *Iron Age*, Vol. 139, Mar. 25, 1937, pp. 30-33. Gives details and illustrates strip core-loss tester developed by General Electric Co. Machine described is designed for 60-cycle core-loss measurement at flux densities ranging from B-8000 to B-15,000. Accuracies within 5% are obtainable. It will test single specimens of 25 cm. by 3 cm. and of any thickness between 0.010 in. to 0.031 in. Studies such as effect of rolling direction, homogeneity, uniformity, stress and various treatments may be made. VSP (9d)

9e. Spectrography

G. R. HARRISON

The Spectrograph in the Iron Foundry for Rapid and Accurate Control Analysis. H. B. VINCENT & R. A. SAWYER (U. Michigan) *J. Applied Phys.*, Vol. 8, Mar. 1937, pp. 163-173. Describes the development of a rapid and absolutely satisfactory spectrographic method for use in the alloy cast iron foundry of the Campbell, Wyant, and Cannon Foundry Co. (Mich.) A condensed spark sample source of the Feussner type was developed which consists of two cast, cylindrical, sample electrodes spaced one quarter of an inch. The spectra are recorded at a normal speed of one sample per minute. Densities of selected lines are measured with a remodeled B. and L. microphotometer and the percentage composition is read from calibration charts. The elements determined and their ranges are: Cr, 0.01%-1.50%; Cu, 0.20%-3.00%; Mn, 0.30%-1.25%; Mo, 0.07%-1.50%; Ni, 0.15%-2.00%; and Si, 0.50%-4.00%. Eight samples, recorded on a single plate, may be analyzed for the above elements in half an hour. The average accuracy of a single determination is around ±1% of the amount of element present, and the maximum deviation in any case is 5% of the amount present. Routine operation shows this method to be more reliable than chemical methods. Extension to other alloys and composition ranges is possible. HFK (9e)

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10. METALLOGRAPHY

J. S. MARSH, SECTION EDITOR

The Freezing of Cast Iron. ALFRED BOYLES (Battelle Mem. Inst.) *Metals Tech.*, Vol. 4, Apr. 1937, T.P. 809, 60 pp., *Foundry*, Vol. 65, Mar. 1937, pp. 54, 56. Original research. Structures of cast Fe and different alloys were studied microscopically after solidifying under different cooling conditions. Freezing was studied by quenching from the partially molten condition. On the basis of the results a hypothesis is proposed to explain the phenomenon of modification. The following 3 factors must be considered in explaining freezing behavior of different irons: (1) Cast Fe is essentially an alloy of Fe, C and Si whose structure is profoundly altered by the presence of Mn, S and H; (2) the type of structure called "normal" is due to influence of Mn, S and H; (3) by varying the amounts of Mn, S and H a great variety of structures can be produced with the same rate of cooling. Fine graphite may originate either by very slow or by very rapid graphitization. The H content of Fe apparently influences the stability of Fe_3C and therefore has a pronounced effect on the size of the graphite flakes. An alloy saturated with H at 2850° F. froze white, the carbide being exceedingly stable. In the same alloy remelted in H at 2500° F. the H content dropped sufficiently to allow precipitation of fine graphite. On remelting in N coarse graphite flakes were formed. On remelting in vacuo fine graphite flakes were formed because of rapid carbide dissociation. 10 references. JLG + VSP (10)

On the Formation of Flaky Graphite in Cast Irons. KAKUNOSUKE MIYASHITA (Kokusan Industry Co., Ltd.) *Tetsu to Hagane*, Vol. 23, Feb. 25, 1937, pp. 136-144. In Japanese. Original research. The effect of N on the graphitization of cast Fe was determined by observing eutectic arrests of cast irons melted under various conditions, and the following conclusions were drawn: In those irons in which N is below 0.0015%, the eutectic arrest appeared always at a constant temperature, and very fine, uniformly distributed graphite was obtained; when N content in the Fe is above 0.0020%, the eutectic arrest occurred in steps and flaky graphite colonies surrounded by fine graphite and free cementite were obtained. In order to obtain eutectic graphite or pearlitic cast Fe, the material must be low in N with the eutectic arrest occurring at a constant temperature. NS (10)

Distribution and Diffusion of Hydrogen in Ingots. TADAKAZU YAJIMA (Japan Special Steel Co.) *Tetsu-to-Hagane*, Vol. 23, Jan. 25, 1937, pp. 40-45. In Japanese. Original research. A distribution map of H_2 in 3 kinds of ingots was established, using an improved vacuum fusion method. H_2 content increased uniformly from outer to inner part of the ingot reaching a maximum of .00086%. H_2 escapes by diffusion on heating; the diffusion commences at 500° and becomes rapid at 900°, and hence H_2 content can be lessened by forging. The stress set up by the dissolved H_2 in ingots is calculated, using the data obtained. Under certain circumstances the pressure of H_2 in a small fissure becomes greater than the strength of the steel and causes cracks, but normally its high diffusion velocity prevents excessive pressure build-ups. It is concluded that hydrogen simply *promotes* the development of flakes, and is not the principle cause of their formation. NS (10)

What is Cast Iron? *Ind. Standardization*, Vol. 7, Aug. 1936, p. 219. The Met. Advisory Comm. Natl. Bur. Standards has under consideration a tentative definition based on the eutectic carbide or graphite content of the Fe. AGS (10)

Precision Determination of Lattice Constants of Large Grained Material (Präzisionsbestimmung der Gitterkonstanten grobkörniger Stoffe). H. KOSTRON. *Z. Metallkunde*, Vol. 28, Dec. 1936, pp. 390-391. A specially designed cam is described, which exposes a large area of the specimen in a back-reflection X-ray camera. GD (10)

A Note on the Mounting of Specimens in Bakelite. J. L. EVERHART (U. S. Metals Refining Co.), *Metals and Alloys*, Vol. 8, Apr. 1937, p. 115. Describes method of mounting in bakelite without pressure and lists materials suitable. WLC (10)

Chart for the Estimation of Inclusions in Steel. BERTIL RINMAN, HANS KJERRMAN & BENGT. KJERRMAN. *Metal Treatment*, Vol. 2, Winter 1936, pp. 190-193. See *Metals and Alloys*, Vol. 7, Oct. 1936, p. MA 502L/3. JCC (10)

Recrystallization during Hot-working (Rekristallisation bei Warmverformung) H. KORNFELD. *Arch. Eisenhüttenw.*, Vol. 10, Oct. 1936, pp. 161-163. The grain size produced by recrystallization of low-carbon steel worked below the A_3 point depends somewhat on the original grain size. The grain size of iron worked above the A_3 point depends mainly on the degree of working and the finishing temperature. However, further clarification of the changes in grain size during working above A_2 is needed. SE (10)

Structural Examination of Aluminum Alloys (Gefügeuntersuchung von Aluminium-legierungen) H. HANEMANN. *Aluminium*, Vol. 19, Jan. 1937, pp. 7-11. An attempt is made to establish for Al a standard microstructure to serve as basis for comparison of Al alloys. This structure is produced by melting a dry sample of Al in a C crucible, stirring for 3 min. at 680° C., and then cooling slowly in air. Several structures of commercial Al are compared with this standard. Ha (10)

Sources of Error in the Preparation of Metallographic Specimens (Fehlerquellen bei der Behandlung von Metallschliffen) F. ROLL. *Giesserei*, Vol. 23, Dec. 4, 1936, pp. 645-652. Practical. Selecting a specimen, grinding, polishing, etching, and correct photographing are discussed. Ha (10)

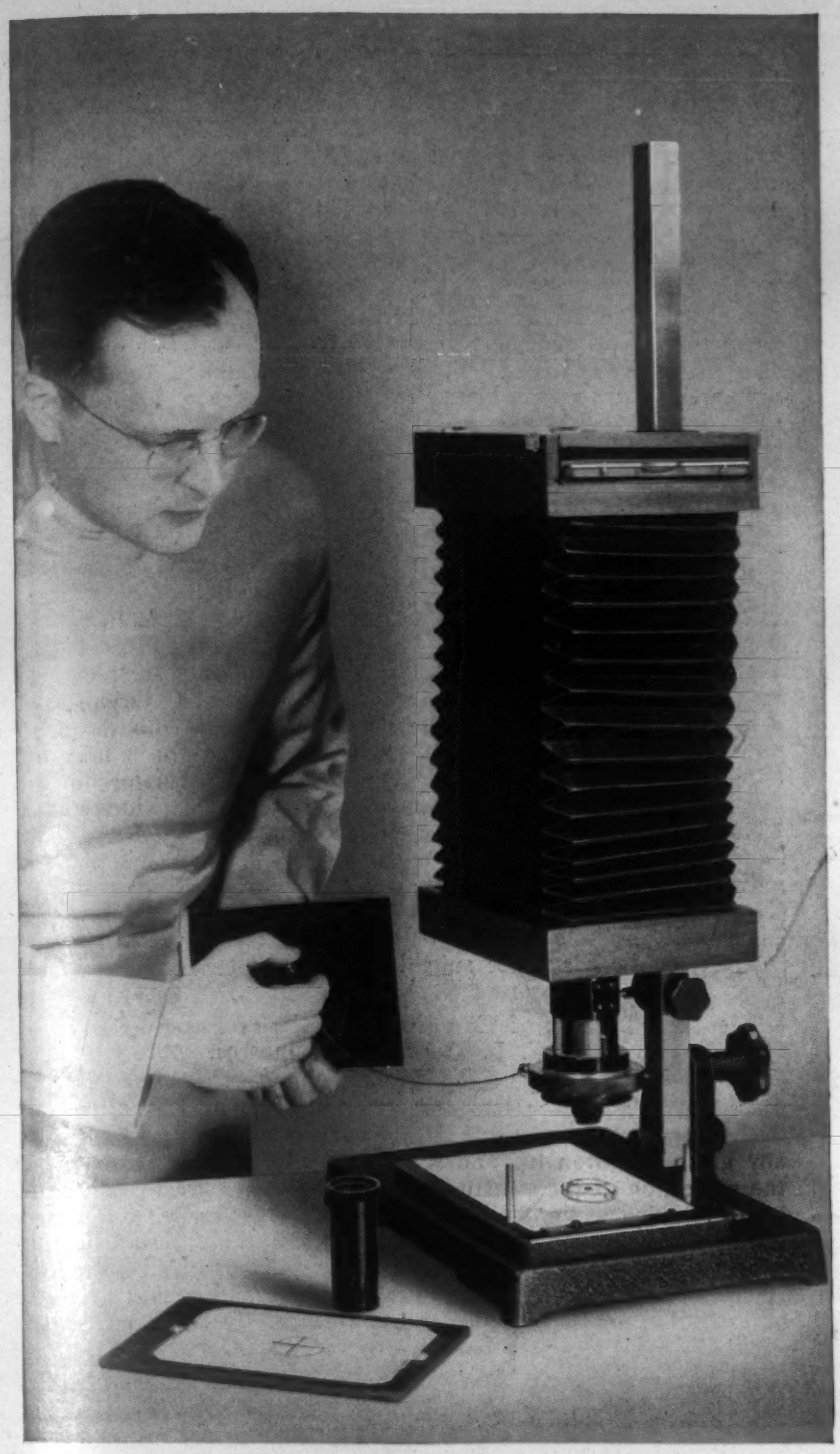
Segregation in Single Crystals of Solid Solution Alloys. ARTHUR PHILLIPS & R. M. BRICK (Yale Univ.) *Metals Tech.*, Vol. 4, Feb. 1937, T. P. 785, 17 pp. Original research. Al-, Cu- and Ag-base alloys were studied. A special case of gravity segregation was found during the melting of solid solution alloys preparatory to remelting to form single crystals. It occurs upon heating through the solidus-liquidus range when the 2 component elements differ greatly in density. Results obtained by slow solidification along a vertical temperature gradient indicated that interdendritic feeding took place in practically all specimens. Whether this feeding overcomes the natural tendency towards normal segregation or coring depends to a large extent on the diffusion rate of the solute element and the temperature conditions along the dendritic contraction channels. 25 references. JLG (10)

The Deformation Structure of Certain Steel Wires (Sulla Struttura di Deformazione di alcuni Fili di Acciaio) V. MONTORO. *Met. Ital.*, Vol. 28, Nov. 1936, pp. 549-550. Original research. It was shown by G. Kurdjumow and G. Sachs (See *Metals and Alloys*, Vol. 2, Nov. 1931, p. MA 252) that the deformation structure of electrolytic Fe (0.01-0.02% C) and of "Weicheisen Krupp" (0.05-0.06% C) is not modified by recrystallization and hardening. Montoro extends this work by showing that high-C steel behaves similarly, using 2 samples of wire, the 1st (0.4 m. in diam.) containing 0.802% C, the other (1.4 mm. diam.) containing 0.852% C. X-ray spectrograms show no change after the thermal treatment. AWC (10)

Transformation Processes in Irreversible Iron-nickel Alloys (Ueber den Ablauf der Umwandlungen bei den irreversiblen Eisen-Nickel-Legierungen) F. WEVER & HEINR. LANGE. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf*, Vol. 18, No. 15, 1936, pp. 217-225. Nature of and literature on irreversibility of Ni-Fe alloys is reviewed and new work seeking an explanation by comparison with transformation in the Fe-C system is described. Magnetic examination showed at the γ-α transformation no change in the Ni content of the two phases. The α-γ transformation, however, takes place with changes in the Ni concentration that indicate heterogeneous equilibrium. This change in concentration in the α-γ transformation was corroborated by X-ray examination. 12 references. Ha (10)

Gold Sodium Alloys (Ueber Gold Natrium Legierungen) W. HAUCKE (Technische Hochschule, Darmstadt) *Naturwissenschaften*, Vol. 25, Jan. 22, 1937, p. 61. Original research. X-rays indicate a homogeneous phase corresponding to Au_2Na between 32 and 42 atomic % Na in the Na-Au system. Au_2Na is cubic with the unit dimension of 7.79 A.U. There are 24 atoms in the unit cell in the same positions as in Cu_2Mg. A new phase, apparently $AuNa_2$, was discovered. $AuNa_2$ is tetragonal with 6 atoms in the unit cell. JZB (10)

The Significance of Grain Size in Steel (Die Bedeutung der Korngrösse beim Stahl) O. LEIHENER. *Stahl und Eisen*, Vol. 56, Oct. 22, 1936, pages 1273-1278. A review. SE (10)



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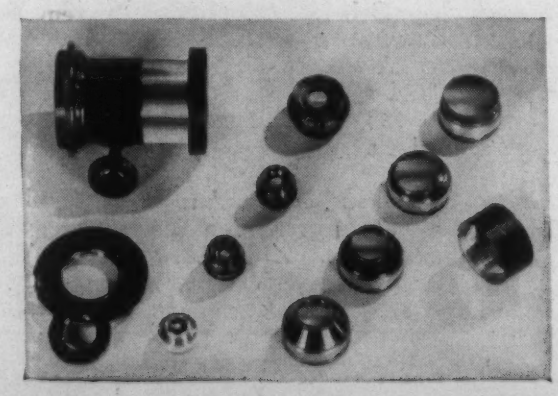

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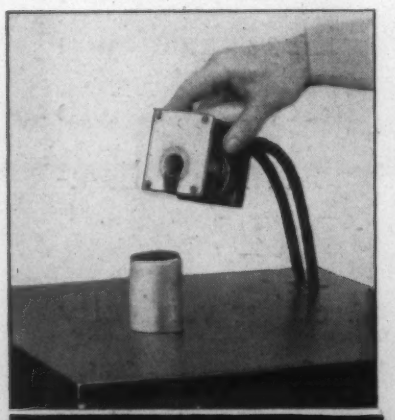

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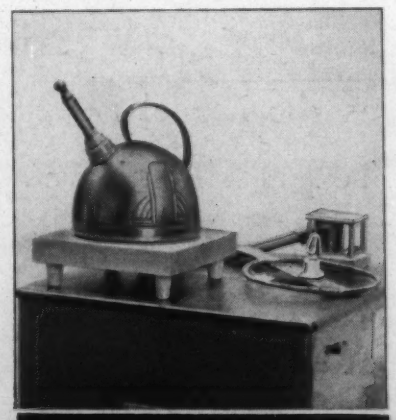

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The Iron Corner of the Iron-Vanadium-Carbon System (Beitrag zur Kenntnis der Eisenecke im Dreistoffsystem Eisen-Vanadin-Kohlenstoff) F. WEVER, A. ROSE & H. EGGERS. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf,* Vol. 18, No. 17, 1936, pp. 239-246. Original research. V forms solid solutions with both α- and γ-Fe. In addition to the known phases in the Fe-C system, V_4C_3 occurs. Two possible forms of the diagram are described. These depend upon the kind of α-γ-Fe_3C-V_4C_3 equilibrium; one shows it to be $\gamma \rightleftarrows \alpha + V_4C_3 + Fe_3C$, the other, $\gamma + V_4C_3 \rightleftarrows \alpha + Fe_3C$. The thermal and micrographic tests are described in detail. The structure of quenched V steels shows, when the critical cooling velocity is exceeded, austenite or martensite (without V_4C_3) in only a small range, the C concentration depending on the V content. In the range of very high temperatures, hypoeutectic steels can contain pure V-austenite, and the 4-phase plane $\alpha + \gamma + V_4C_3 + Fe_3C$ lies at the temperature of the pearlite line. 6 references. Ha (10)

Physical Principles Underlying Processes of Structural Changes and Grain Growth. I. S. GAEV. *Metallurg,* Vol. 11, Nov. 1936, pp. 25-36. In Russian. Mathematical treatment of atomic motions associated with transformations in metals on solidification and cooling offered by many investigators is reviewed. Experimental results obtained during study of granulation are presented. Steel samples containing 0.5% Mn, 0.25% Si and C varying from 0.39 to 2.62% were inserted in a tube, packed with magnesite powder, rapidly heated to 900-1300° C., soaked for 3 hrs., furnace cooled to 650° C., and then to room temperature in air. Grain size expressed as a function of C content increases at 1300° C. from 0 to 1.3% C and then drops. Up to 1.3% C the liquid phase does not interfere with crystallization, and then its influence increases. Grain size is plotted against temperature and C content to indicate the relation between the variables involved. The results indicate that for determination of true grain size carburizing methods are not suitable. (10)

The Employment of Contoured Graphs of Structure-factor in Crystal Analysis. W. L. BRAGG & H. LIPSON. *Z. Krist.,* Vol. 95, Dec. 1936, pp. 323-337. In English. Descriptive of the use of contoured graphs of structure-factor in X-ray analysis of crystals. Such graphs permit values of the structure-factor to be read for any given reflection hk, and for an atom at any intersection xy in the projection of the structure of a plane. They greatly reduce the labor involved in the search for an atomic arrangement corresponding to the observed intensities of reflection. It is shown that the total number of formulas required for projections of all symmetries is small. A list of the formulas is given, and typical examples of the corresponding graphs are reproduced. EF (10)

Structure of Liquid Metals (Die Struktur der flüssigen Metalle) W. DANILOW & I. RADTSCHENKO. *Physik. Z. Sowjetunion,* Vol. 10, No. 2, p. 160. In German. Original research. X-ray photographs of liquid Bi, Sn and Pb in vacuum showed distinct maxima. The diffraction pattern of liquid Pb resembles that of Hg. There seems to be a relation between the structures of liquid and solid Bi and Sn. EF (10)

The System Iron-Cobalt-Copper (Das System Eisen-Kobalt-Kupfer) W. JELLINGHAUS. *Arch. Eisenhüttenw.,* Vol. 10, Sept. 1936, pp. 115-118. A ternary diagram of the phases existing at room temperature and at 950° C. is shown. Binary diagrams of Fe-Cu alloys up to 12% Cu and containing 10, 25, 50, 70, and 75% Co are also given. SE (10)

Determining the Inclusion Content of Roller Bearing Steel (Beurteilung von Walzlagerstählen nach den Schlackeneinschlüssen) H. DIERGARTEN. *Arch. Eisenhüttenw.,* Vol. 10, Nov. 1936, pp. 197-210. Review. Various methods of determining metallographically the inclusion content of roller bearing steel are discussed. SE (10)

The Mechanism of Precipitation and Transformation (Der Mechanismus von Ausscheidungen und Umwandlungen) U. DEHLINGER. *Arch. Eisenhüttenw.,* Vol. 10, Sept. 1936, pp. 101-105. See *Metals and Alloys,* Vol. 7, Aug. 1936, p. MA 414R/8. SE (10)

Report on Methods of Determining Oxygen in Ferrous Materials. *Ind. Standardization,* Vol. 7, Oct. 1936, p. 262. Data from 34 laboratories indicate the vacuum-fusion method yields accurate results for the O content of plain C steels; the aqueous iodine method gives good results for some types of killed steels but low results for other steels. AGS (10)

Study of Phase Equilibria in the System Gold-copper. N. V. AGEEW & D. N. SHOYKET. *Izvest. Sektora Fiz. Khim. Anal.,* Vol. 9, 1936, pp. 129-146. In Russian. See *Metals and Alloys,* Vol. 6, Sept. 1935, p. MA 370L/6. NA (10)

The Reactivity of Alloys at Transformation Points in the Solid State II (Ueber die Reaktionsfähigkeit von Legierungen bei Umwandlungen im festen Zustande II) J. ARVID HEDVALL & U. ROSEN. *Z. anorg. allgem. Chem.*, Vol. 229, Dec. 1, 1936, pp. 413-418. The transformation temperatures of pulverized Co-Sn and Ag-Cd were determined by oxidation tests of the materials; these checked the points as found by thermal methods. A phase transformation, when unaccompanied by any change in chemical concentration or dispersion that may resist the transformation of the most reactive components, will tend in general toward a higher reactivity of the higher temperature phase due to its surplus energy content. This should also hold for purely crystallographic or other physical transformations with practically constant reacting surface. Tests show that this may also be the case where there is an increase in reacting surface during the change in phase, due as a rule, to the reaction products in the intermediate stages having a lattice of faulty or open structure. WB (10)

Diffusion of Iron and Zinc (Osservazioni sulla Diffusione tra Ferro e Zinco) V. MONTORO. *Met. Ital.*, Vol. 28, Nov. 1936, pp. 551-557. Original research. Samples of iron and steel were kept immersed in molten Zn at 460°-500° C. for periods up to 8 hrs., and then examined with X-rays. Diffusion of Zn into the Fe or steel was practically negligible. AWC (10)

Reactions in Solid Metals (Reaktionem in festen Metallen) G. MASING. *Angew. Chem.*, Vol. 49, Dec. 19, 1936, pp. 907-915. Review of cooling kinetics. 30 references. Ha (10)

The Limitations of the Hume-Rothery Rule (Der Gultigkeitsbereich der Hume-Rotheryschen Regel) H. WITTE (Mineralogisches Inst. Göttingen) *Metallwirtschaft*, Vol. 16, Mar. 5, 1937, pp. 237-245. Up-to-date review. The author, using Hansen's "Der Aufbau der Zweistofflegierungen" and other recent information assembles the data on all intermediate phases possessing the β, γ or ϵ brass structures. The phase boundaries were considered as the furthest extent of a phase region without regard to temperature; when the phase boundaries were unknown or very narrow, only the composition of the phase in atomic % was used. By plotting the electron to atom (E.A.) ratio of the various intermediate phases over their range of homogeneity, the author reaches the conclusion that the γ type structure obeys Hume-Rothery's rule satisfactorily, the β brass structure fairly well, but the ϵ brass structure showed considerable deviation. About half of the 80 intermediate phases considered fulfilled the Hume-Rothery rule in that the E.A. ratio for the particular structure lies in the homogeneity range of the phase and that the homogeneity field does not include the E.A. ratio of another type of structure. It is an open question whether the intermediate phases which do not obey the H-R. rule obey other rules or whether the rule must be applied with the limitation that from the type of structure the E.A. ratio, and thus the number of valence electrons of the components can be established. In general, however, conclusions about type of structure from the valence electrons and calculation of the E.A. ratios therefrom are inadvisable as yet. GA (10)

Lattice Dimensions of Electroplated and Normal Chromium. W. A. WOOD (Nat. Phys. Lab.) *Phil. Mag.*, Vol. 23, May 1937, pp. 984-991. Original research. Lattice spacings of pure, electrodeposited, and annealed Cr were compared by X-ray diffraction methods. The unit cube of the electrodeposited material is larger than that of pure Cr, and the difference persists after annealing. The larger lattice may be the result of gases adsorbed during plating. The cubic unit cell of pure Cr measures $a = 2.879_6$ A.U. at 18° C.; a was 0.00205 A.U. longer for bright electrodeposited Cr, 0.0015 A.U. longer for dull deposits and 0.00093 A.U. longer for normalized Cr. 4 references. Ha (10)

The Crystal Structure of Gallium Nitride. J. V. LIRMANN & H. S. SCHDANOV (Inst. Phys., Moscow Univ.) *Acta Physicochim. U.R.S.S.*, Vol. 6, 1937, p. 306. In English. Letter to editor. GaN was obtained by heating metallic Ga in NH_3 to 1200° C. GaN has hexagonal structure of the wurzite type and its cell dimensions are near those of the isomorphic ZnO: $a = 3.160 \pm 0.008$ A.U., $c = 5.125 \pm 0.010$ A.U., $c/a = 1.622$. EF (10)

Effect of Small Deformation on the X-ray Diffraction Pattern (Auswirkung kleiner Verformungen auf das Röntgen-Feingefügebild) E. MARTIN. *Arch. Eisenhüttenw.*, Vol. 10, Mar. 1937, pp. 415-417. Debye-Scherrer patterns of annealed and then deformed wires of Al, Cu, Ni, and steel (about 0.2% C) indicated that deformation in tension beyond the elastic limit could be detected by means of X-rays, particularly in Fe. Debye rings obtained by the reflection method also indicated deformation in repeated impact tests of steel but not so distinctly as in tension tests. Cold deformation resulted in more continuous and clearly separated $K\alpha$ doublets in the $K\alpha_1$ and $K\alpha_2$ rings. SE (10)

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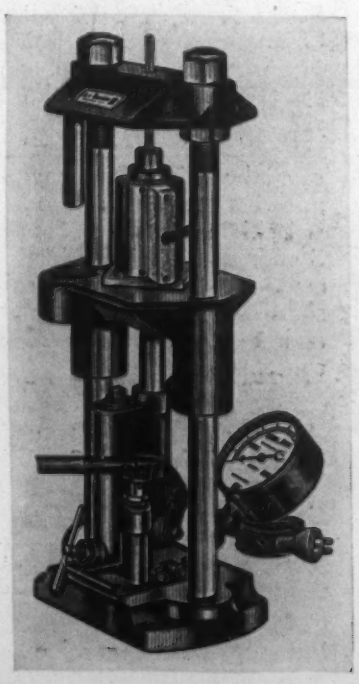

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Thermomagnetic Studies on Transformations in the Troilite-pyrrhotite Region of the Iron-sulphur System (Eine thermomagnetische Untersuchung der Umwandlungen im Troilit-Pyrrhotin Gebiet des Eisen-Schwefel Systems Magnetochemische Untersuchungen. XXIV) HAAKON HARALDSEN (Danzig, Tech. Hochschule) *Z. anorg. allgem. Chem.*, Vol. 231, Mar. 8, 1937, pp. 78-96. Various solid transformations in the troilite-pyrrhotite range of the Fe-S system were studied by means of magnetic susceptibility vs. temperature changes. The transformations indicated by this method agree quite well with earlier values determined by thermal methods but a complete explanation of the data is lacking. The boundary between the troilite phase and the lower S ranges was established at $FeS_{1.00}$. The change from the paramagnetic troilite solid solution to the ferromagnetic pyrrhotite solid solution takes place at $FeS_{1.10}$ at temperatures between 20° C. and 275° C. Above 275° C. the boundary shifts to higher S concentrations. HFK (10)

Mechanism of Structural Transformations Occurring in Tempering High-speed Steel. A. P. GULIAEV. *Metallurg*, Vol. 11, Dec. 1936, pp. 73-79. In Russian. Dilatometric study of 0.75% C, 18.3% W, 4.16% Cr, 0.50% V steel. Quenching from 850°-900° C. results on tempering in a transformation beginning at 100° and ending at 350° C. connected with increase in volume. With increasing quenching temperature the break at 100°-200° C. becomes more pronounced and the changes at 350° C. less so. Transformation of tetragonal martensite into cubic is held responsible for 100°-200° C. transformation. Higher quenching temperature leads to lower martensitic transformation range. Soaking time at quenching temperature intensifies austenitic transformation and the beginning temperature of transformation rises. No troostite formation was recorded so that the steel is composed of carbides, austenite and martensite only when tempered under 600° C. Rising tempering temperature has the same influence as longer soaking time at the quenching temperature, i.e. precipitation of carbides from the solid solution. Austenite-martensite transformation cannot be prevented by any cooling speed. Interrupted cooling has no effect on the character of dilatometric curves produced. Each additional tempering increases the amount of martensite in steel, although the intensity of reactions involved decreases progressively. Greater residual austenite content produced by higher quenching temperature is shown on a number of diagrams. (10)

Deformability during the γ-α Change in an Iron-nickel Alloy (Untersuchungen an einer Eisen-Nickel-Legierung über die Verformbarkeit während der γ-α Umwandlung) G. WASSERMANN. *Arch. Eisenhüttenw.*, Vol. 10, Jan. 1937, pp. 321-325. Original research. The deformability during the γ-α change in 30% Fe-Ni alloys in which the transformation takes place at subatmospheric temperatures was studied. As in Fe, in which the transformation takes place at elevated temperatures, the deformability or plasticity increased decidedly on passing through the γ-α change. SE (10)

Etching of Molybdenum by Alkaline Potassium Ferricyanide Solutions (Die Anätzung von Molybdän durch alkalische Ferricyankaliumlösungen) J. A. M. VAN LIEMPT. *Rec. Trav. Chim.*, Vol. 55, Nov. 1936, pp. 989-990. In German. A solution of 360 g. $K_3Fe(CN)_6$ and 36 g. NaOH in 1 liter H_2O is best for bringing out the intermediate phase in Mo. EF (10)

The Transformation Kinetics of Austenite. VI. Austenite Decomposition in Carbon Steels. I. (Zur Umwandlungskinetik des Austenits. VI. Der Austenitzerfall bei den Kohlenstoffstählen. I.) F. WEVER & H. HÄNSEL. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf*, Vol. 19, No. 3, 1937, pp. 47-56. Original research. The mechanism of austenite transformation in alloy steels and a method of following it by determining magnetic isotherms are explained, a special magnetic balance is described that can be used in the temperature range from 700° to 150° C. A C steel with 1.16% C, 0.10% Si and 0.14% Mn showed, unlike Cr-Ni steels, a uniform transformation rate during the entire time of transformation, and has a maximum transformation velocity at 550° C. If secondary cementite were originally present cementite precipitation is favored at low temperatures of long duration and the transformation accelerated. The entire transformation process is illustrated by a series of microphotographs. 11 references. See also *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 100R/1. Ha (10)

Mounting and Polishing of Tin Alloys. H. J. TAFFS. *J. Roy. Microscopical Soc.*, Vol. 56, 1936, p. 300. *Metal Progress*, Vol. 31, Apr. 1937, pp. 395, 432, 433. Discusses a number of mounting materials for specimens of tin, tinplate, tin alloys and soldered joints. Requirements are that the mountant must harden to about same hardness as specimen, be chemical inert, not smear or introduce complications in the polishing and harden at temperatures that will not affect the alloy. Liquid bakelite appears to be most satisfactory as the temperature and pressure required to harden the powdered material is objectionable. WLC (10)

The Spatial Shape of Graphite (Beitrag zur Raumform des Graphits) F. ROLL. *Giesserei*, Vol. 24, Apr. 23, 1937, pp. 206-208. Original research. The manner in which the graphite is distributed in the structure of cast Fe determines its static properties; recently it has been found that graphite is also responsible for the damping capacity of cast Fe and its rigidity. Determinations of the exact location, stratification and structure of the graphite were attempted. A few results of experiments are described in which the metallic constituents were dissolved by suitable acids and the graphite skeleton was isolated. 6 references. Ha (10)

Grain-boundary Corrosion and Etched Structure of 18-8 (Korngrenzenkorrosion und Gefügeätzungen bei Stahl mit 18% Cr and 8% Ni) P. SCHAFMEISTER. *Arch. Eisenhüttenw.*, Vol. 10, Mar. 1937, pp. 405-413. Original research. Samples of 18-8 were heated to the carbide-precipitation temperature of about 750° C. and immersed in hot $CuSO_4$-H_2SO_4 solution. The dissolved portion analyzed only 9 to 13% Cr, whereas the dissolved portion of samples with no carbide precipitation analyzed 18% Cr. This seems to confirm the theory that grain boundary carbide precipitation and consequent intercrystalline corrosion is due to Cr impoverishment of the areas surrounding the precipitated Cr carbides. Electrolytic etching in 10% ammonium sulphate solution is recommended for detecting carbide precipitation. SE (10)

Density and Structure of Zirconium (Dichte und Struktur des Zirkons) K. CHUDOBA & M. v. STACKELSBERG. *Z. Krist.*, Vol. 95, Nov. 1936, pp. 230-246. Review plus original research on density and optical properties of the 3 Zr modifications. Rotating crystal Laue and powder photographs show that the "light Zr samples" represent no new modification. The a-Zr samples are assumed to contain large quantities of a light amorphous contamination. Heating to 1450° C. converted the investigated Zr samples (c-Zr and a-Zr with density of 4.32 and 4.15 respectively) into normal b-Zr. [The authors do not refer to recent tests of de Boer, Clausing & Fast *(Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 226R/3,5,7) who investigated the alloptropic changes of Zr. E. F.] EF (10)

11. PROPERTIES OF METALS AND ALLOYS

Magnetic Anistropy of Single Crystals of Iron and Nickel (Zur magnetischen Anisotropie von Einkristallen aus Eisen und Nickel) H. SCHLECHTWEG. *Ann. Physik,* Vol. 27, Dec. 1936, pp. 573-596. **Some Problems of the Ferromagnetic Behavior of Single Crystals of Iron and Nickel (Einige Probleme des ferromagnetischen Verhaltens von Einkristallen aus Eisen und Nickel)** IBID. *Tech. Mitt. Krupp,* Vol. 5, Feb. 1937, pp. 1-8. Original research. A single crystal disc suspended in a magnetic field with its plane parallel to the field shows a suddenly changing torque at places where the equilibrium becomes unstable. The theoretical determination of the anisotropy is explained. 28 references.
SE + Ha (11)

The Equilibrium of the Reaction of Oxidation of Nickel with Carbon Dioxide. A. F. KAPUSTINSKY & ANNA SILBERMANN. *Acta Physicochim. U.R.S.S.,* Vol. 5, No. 5, 1936, pp. 605-616. In English. The equilibrium constants of Ni, Ni protoxide, CO and CO_2 are investigated and compared with previous work. From the data obtained, the heat of formation, free energy and entropy of NiO have been calculated. See also *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 133L/6.
EF (11)

11a. Non-Ferrous

A. J. PHILLIPS, SECTION EDITOR

Free-cutting Aluminum-magnesium Alloys (Leichtmetall-Automatenlegierungen auf Aluminium-Magnesium Basis) H. BOHNER (I. G. Farb. A.-G.). *Aluminium,* Vol. 19, Mar. 1937, pp. 131-139. General discussion. Machinability as influenced by the tools is considered primarily. Tools satisfactory for Fe and Cu alloys are not satisfactory for Al, usually producing an undesirable long chip. On the other hand, chemical resistance must not be sacrificed. Al-Mg alloys can be made to give short chips by an increased addition of intermetallic aluminides insoluble in Al; part of these aluminides are decomposed by peritectic reactions to give an extremely fine distribution of the aluminides in the piece. Annealing also favors formation of short chips. Fe and Si additions serve the same and without the necessity of annealing to increase chemical resistance. Addition of Zn effects a very fine distribution of both aluminides and Mg_2Si. 10 references.
Ha (11a)

Light Alloys for Automatic Machining. *Metal Treatment.* Vol. 2, Winter 1936, pp. 198-200, 204. A correlated abstract. Recent methods proposed for improving the free cutting properties of Al alloys include the addition of Mg with or without compound-forming elements (which are decomposed and dispersed by diffusion of the Mg on heat treatment) and the addition of Pb or Be, special steps being taken to secure uniform distribution of the Pb. 5 references.
JCC (11a)

A Dynamic Method for the Measurement of Young's Modulus for Imperfectly Elastic Metals, and the Application of the Method to Nickel and Some of Its Alloys. R. M. DAVIES & I. H. THOMAS (Univ. College, Wales). *Phil. Mag.,* Vol. 23, Mar. 1937, pp. 361-397. The meaning of Young's modulus as applied to imperfectly elastic substances is defined, the theory developed and applied to annealed and unannealed specimens of Ni and Ni alloys. The results are given in tables. 17 references.
Ha (11a)

The Effect of Pressure on the Modulus of Rigidity of Several Metals and Glasses. FRANCIS BIRCH (Harvard Univ.). *J. Applied Phys.,* Vol. 8, Feb. 1937, pp. 129-133. Original research. A resonance method for producing magnetically torsional vibration in a test cylinder enclosed in a pressure vessel was developed to determine the modulus of rigidity of steel, Ni, Cu, Al, Monel, Pyrex glass and silica glass under various pressures up to 55,000 lbs./in.^{2} The effect of viscosity due to the pressure medium was shown to be negligible. Some absolute values of the dynamic moduli are given and also a comparison of derived and observed compressibilities. After allowance is made for the difference in adiabatic and isothermal conditions the results for Ni, Cu, Monel and Pyrex indicate anisotropy.
HFK (11a)

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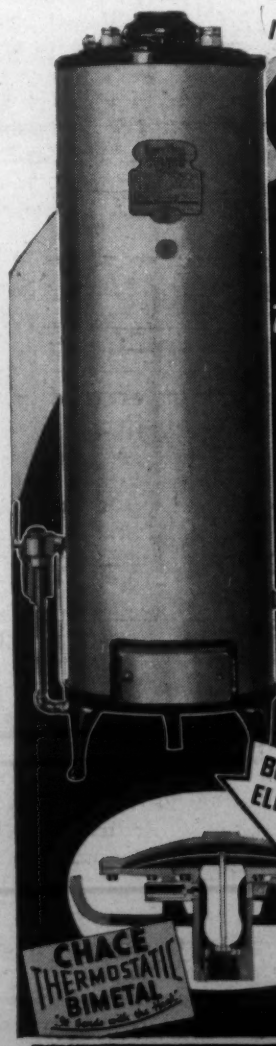

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Influence of Cobalt, Chromium and Manganese on Iron-nickel-aluminum Magnetic Alloys. A. S. ZAIMOVSKI & P. I. DENISSOV. *Kach. Stal,* Vol. 4, No. 10, 1936, pp. 31-38. In Russian. Original research, showing that additions of Co, Cr and Mn to Fe-Ni-Al alloys do not increase their saturation. Saturation is possible only by lowering Ni and, particularly, Al content. Co pronouncedly stabilizes α solution and increases coercive force, when it replaces a part of Ni or Al. An alloy, developed during the investigation, contains 20-22% Ni, 9-12% Al, and 5-10% Co has residual induction of 7000-8000 gauss and coercivity of 400-500 oersteds. Study of magnetization curves indicates that in high coercivity alloys the influence of natural anisotropy is small, major influence being attributed to internal stresses. (11a)

Resistance, Spontaneous Magnetization and Curie Point of Nickel (Widerstand, spontane Magnetisierung und Curiepunkt von Nickel) W. GERLACH, H. BITTEL & S. VELAYOS. *Sitzber. Math.-naturw. Abt. Bayer. Akad. Wiss. München,* Vol. 1, Jan./Apr. 1936, pp. 81-136. An extensive review of previous investigations on the magnetic and electrical properties of nickel. A comparison with the authors' experiments is made in 6 chapters. The effect of temperature (—200° to +600° C.) on electrical resistance of Ni (various purities) is discussed. The resistance/temperature curves can be reduced to the ideal curve of purest Ni by means of Matthiessen's additive rule. The interrelationship between the square of the spontaneous magnetization and the resistance anomaly is critically discussed. The purity of the Ni has no effect on the proportionality constant. The resistance anomaly and its interpretation by Borelius is considered at length. An inner spontaneous magnetization occurs far above the generally accepted magnetic transformation point. Data are collected to prove that Ni gradually loses its spontaneous magnetization far above the temperature hitherto regarded as the Curie point. EF (11a)

Influence of Sodium and Calcium on Aluminum (Einfluss von Natrium und Kalzium auf Aluminium) B. F. GRASHTCHENKO & V. DAROVSKI. *Leichtmetall,* Feb. 15, 1937, p. 5. Extended abstract. See *Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 603L/7. JZB (11a)

Aluminium; Physical and Chemical Characteristics. S. R. CARTER. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 2. Summary of familiar material. MS (11a)

The Corrosion-resistance of Duralumin Sheet. Influence of Salt-bath Heat-treatment. A. J. SIDERY & B. EVANS. *Sheet Metal Ind.,* Vol. 10, Oct. 1936, pp. 763-764, 796. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 106R/5. AWM (11a)

Electric Conductivity of Purest Aluminum and the Effect of Small Metallic Additions (Die Leitfähigkeit von höchstreinem Aluminium und der Einfluss von geringen metallischen Zusätzen) G. G. GAUTHIER. *Aluminium,* Vol. 18, Nov. 1936, pp. 564-567. See *Metals and Alloys,* Vol. 8, Jan. 1937, p. MA 36R/4. Ha (11a)

Effect of Heat Treatment on Magnesium-free and Magnesium-containing Silumin Castings (Die Wirkung der Warmbehandlung bei magnesiumfreiem und magnesiumhaltigem Siluminguss) G. GÜRTLER (Metallgesellschaft A.G.) *Aluminium,* Vol. 19, Feb. 1937, pp. 66-70. Original research. Deals with the effect of heat treatment on the static and dynamic properties of Mg-free and Mg-containing Silumin. Mg_2Si in sand castings has a noticeable effect on elastic limit, tensile strength and elongation only in precipitation hardening; but no effect could be found on endurance strength. The mechanical properties of chill-mold castings of Silumin containing Mg are superior to Mg-free Silumin both in cast state and homogeneized. This is explained by the size and distribution of the Mg_2Si crystals and by the Mg_2Si content of the solid solution. 4 references. Ha (11a)

Notes on the Hardness and Conductivity of Heat-treated Copper Castings Alloyed with Zr and Be. G. F. COMSTOCK & R. E. BANNON (Titanium Alloy Mfg. Co.). *Metals and Alloys,* Vol. 8, Apr. 1937, pp. 106-109. Original research. Data are presented indicating that Cu-Zr, under proper heat treatment, shows interesting electrical conductivity and that Zr used with Be increases the hardness slightly and the hardness is stable at temperatures that would soften plain Cu-Be alloys. WLC (11a)

The Magnetic Behavior of Nickel at Temperatures up to the Curie Point (Das magnetische Verhalten von Nickel bei Temperaturen bis zum Curiepunkt) W. SCHNABL. *Ann. Physik,* Vol. 27, Sept. 1936, pp. 169-185. The magnetic losses in Ni wires below the Curie point and for frequencies between 0 and 50 were found to increase with frequency. At the higher temperatures dependence on frequency decreases sharply. 7 references. Ha (11a)

The Mechanical Properties of Heat-resistant Chromium-aluminum-iron Alloys as Compared with Nickel-chromium (Die mechanischen Eigenschaften hitzebeständiger Chrom-Aluminium-Eisen-Legierungen im Vergleich mit Chromnickel) W. HESSENBRUCH. *Elektrowärme,* Vol. 7, Jan. 1937, pp. 7-12. The following characteristics are reported:

Alloy	Elastic Limit, lbs./in.²	Tensile Strength, lbs./in.²	Elongation % in 10 in.	Brinell hardness
80% Ni, 20% Cr, plus small additions	57,000	106,500	30	145
60% Ni, 18.5% Cr, rest Fe and additions	42,500	100,000	30	130
20% Cr, 5% Al, rest Fe	64,000	85,300	14.5	190
25% Cr, 5% Al, rest Fe	74,000	95,300	12.5	200
30% Cr, 5% Al, rest Fe	82,500	102,400	11	210

Creep resistance drops at considerably lower temperatures with the Fe-Cr-Al than with the Ni-Cr. The former, however, can be bent cold around smaller diameter mandrels than can the same size Ni-Cr Wire; for Fe-Cr-Al wire the minimum mandrel diameter is 3-5 wire diameters, while with Ni-Cr it is 5-8 wire diameters. Fe-Cr-Al alloys offer good life-expectancy at 1300° C. Ha (11a)

The Paramagnetism of Cu-Ni Alloys (Der Paramagnetismus der Cu-Ni-Legierungen) G. GUSTAFSSON. *Ann. Physik,* Vol. 28, Jan. 1937, pp. 121-131. Original research. Above the Curie point, certain dependence of the paramagnetism on temperature was found. Ha (11a)

11b. Ferrous

V. V. KENDALL, SECTION EDITOR

Development of Transformer Steel in North America (Entwicklung des Transformatorenstahles in Nordamerika) T. D. YENSEN. *Stahl und Eisen,* Vol. 56, Dec. 24, 1936, pages 1545-1550. A review. The effects of C, O_2, S, P, grain size and orientation on the watt loss of pure Fe are depicted in graphs. The attainment of optimum structure for high Si transformer sheet by cold deformation and annealing is discussed. SE (11b)

Distortion of Iron and Molybdenum. E. W. FELL. *Nature,* Vol. 138, Oct. 31, 1936. Speculation as to why Fe and steel show elongation at the yield point, and other metals generally do not. The unusually large number of possible slip-planes in Fe may be important, permitting motion across several grains without "jamming." Grain size also appears to be a factor. CSB (11b)

Influence of Small Beryllium and Vanadium Additions on Properties and Grain Size of Carbon Steels. S. A. BARANOV & A. N. KHAZAN. *Metallurg,* Vol. 11, July 1936, pages 3-16. In Russian. To two steels containing 0.45% C, 0.25% Si, 0.62% Mn and 0.64% C, 0.14% Si, 0.44% Mn, and properly deoxidized with Mn and Si, enough Fe-Be and Fe-V were added to bring V content of one set to 0.18% V and the Be content of another to 0.09% Be. The properties of the original steel were compared with the characteristics of both V and Be alloys. Be added to steel reduced the critical cooling speed, thus making it suitable for oil quenching. The element improves tensile properties but leads to greater brittleness. The behavior of steel containing V sharply changes on heating to above 900-910° C. when the reduced carburizing properties become normal and the tendency of the metal to produce abnormal structure disappears. This is connected with the decomposition of V_4C_3 into VC in the interval of 910-950° C. Be addition increases carburizing properties of steel at any temperature possibly through formation of stable Be_2C. The final properties are dependent on the treatment accorded the steel before the last heat treating cycle. (11b)

Influence of Oxygen and Inclusions on the Properties of Steel and Cast Iron (Influence de l'Oxygène et des Inclusions sur les Propriétés des Aciers et des Fontes) R. CASTRO. *Usine,* Vol. 45, Dec. 24, 1936, pages 31-35. General discussion. Ha (11b)

Toughness of Cast Iron According to Bending Curves (Ténacité des Fontes d'apres les Courbes Charges/Deformations de l'Essai de Flexion) G. L. HARBACH. *Bulletin de l'Association Technique de Fonderie,* Vol. 10, June 1936, pages 221-232. See *Metals and Alloys,* Vol. 8, Feb. 1937, page MA 70 L/1. WHS (11b)

Construction Steels (Les Aciers de Construction) L. PERSOZ. *Métaux,* Vol. 11, Oct. 1936, pp. 190-194. This is the 3rd installment of a series of articles reviewing the influence of added elements and of impurities on the properties of steels. The first two appeared in Metaux, Oct. 1935, p. 216 and June 1936, p. 125. Mn, Cr, and Si are discussed in the present article. See *Metals and Alloys,* Vol. 7, June 1936, p. MA 314R/1. GTM (11b)

Properties of Technically Pure Iron of Armco Type. E. T. LIAND. *Kach. Stal,* Vol. 4, No. 10, 1936, pp. 23-31. In Russian. Properties of Fe of this type made in Russia were determined. There was no difference between Russian and foreign product. (11b)

Low-alloy High-tensile Steels. A. B. KINZEL. *Iron Age,* Vol. 136, Apr. 23, 1936, pp. 32-36-67. *Steel,* Vol. 99, July 20, 1936, pp. 40, 42, 45. See *Metals and Alloys,* Vol. 7, Oct. 1936, p. MA 500L/2. VSP + MS (11b)

Action of Solutions of Sodium Silicate and Sodium Hydroxide at 250 Deg. C. on Steel Under Stress. W. C. SCHROEDER & A. A. BERK. *Engineering,* Vol. 141, May 22, 1936, pp. 573-574. See *Metals and Alloys,* Vol. 7, May 1936, p. MA 261R/7. VSP (11b)

Free Machining Steels Are Ductile. *Steel,* Vol. 100, Mar. 1, 1937, p. 69. Discusses Monarch Steel Co.'s "Speed Case" steels containing 0.15-0.20% C, 0.30-0.40% C and 0.40-0.50% C, with S held between 0.20 and 0.30%. Machinability is claimed to be almost as good as SAE 1112 Bessemer steel; in addition the combination of other mechanical properties is excellent. MS (11b)

The Strength and Ductility of Cast Steel during Cooling from the Liquid State in Sand Moulds. H. F. HALL. *Foundry Trade J.,* Vol. 55, Nov. 19, 1936, pp. 389, 390, and 392. Section IV, Second Report of the Steel Castings Research Committee. Original research. The test procedure consists of casting a group of test-bars simultaneously in one mold and subjecting each in succession to a tensile test. With prior knowledge of the rate of cooling the tests can be made at a predetermined series of temperatures, with the first as near as may be desired to the point of solidification. Bottom-poured mold for 8 test pieces of 1" diam. cast in cores was employed. The test-pieces were cast with their axes inclined somewhat to the vertical to coincide with the axis of pull during test. The lift of an overhead travelling crane was used for exerting the pull on each test-piece, the mold being held down by dead weights. The test-bars were cast through a down-runner on to bolts fixed to the base of the molding flask. The upper ends of the bars were cast on to rings set in the top of the mold to enable the crane hook to be attached. The breaking load was measured by the ball impression produced by transmitting the pull of the crane through a pair of stirrups, one carrying a steel ball resting on a polished steel plate carried by the other. The rate of increase of strength was generally lowest during the early period of the test, with strength below 0.4 ton./in.^{2}, and before the temperature had attained its maximum rate of fall. At temperatures above 1300° C. ductility was found only in steels containing less than 0.2% C, and with the exception of these and some alloy steels the lowest ultimate stress accompanying ductility was 0.8 ton/in.^{2}. AIK (11b)

Modification of Steel Analysis. W. J. PRIESTLEY. *Blast Furnace & Steel Plant,* Vol. 25, Jan. 1937, pp. 104-105. *Heat Treating & Forging,* Vol. 23, Jan. 1937, pp. 31-32. Review. Lists recent modifications of Cr steels and some of their uses. Includes 9% Cr steel with Mo; 1.50-2.75% Cr steel with Mo and V; Cb-bearing straight Cr and Cr-Ni steels; 16% Cr-1% Ni steel, 18% Cr-8% Mn steel; 35% Cr-7% Al steel; and addition of N for improving grain structure. MS (11b)

The Quality of Steel and the Nature and Effect of Inclusions (Sur la Qualité de l'Acier et les Inclusions) A. PORTEVIN. *Mém. Artillerie Francaise,* Vol. 15, No. 1, 1936, pp 73-91. Excellent introductory review followed by discussion of the Perrin process. "Quality" is ascribed to inclusions, and inclusions to the content of P, S, and O. The origin, nature, and distribution of inclusions, and the effect of thermal and mechanical treatment on them and the steel in which they exist, are discussed. The Perrin process is offered as a valuable improvement in the art of refining. Its importance to national defense (French) is mentioned. DJM (11b)

Chromium-nickel-molybdenum Structural Steel Containing 1.5% Ni. V. A. ERAKHTIN. *Kach. Stal,* Vol. 4, No. 10, 1936, pp. 39-41. In Russian. Physical properties of SAE 4340 steel were investigated as a function of heat treatment and C content. (11b)

The Quality of Boiler Steel with Amorphous and Crystalline Fractures. Z. KOPELMAN (Kirov Plant) *Stal,* Vol. 6, Apr. 1936, pp. 51-58. In Russian. Original research. No difference in mechanical properties was found between plates having an amorphous and those having a fine-grained crystalline fracture. Plates over 20 mm. thick always showed a crystalline fracture. **Remarks.** E. SHUMOVSKII. *Ibid,* p. 59. Appearance of fracture depends mainly on method of testing. HWR (11b)

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Standards for Spring Design. I. W. M. GRIFFITH (Atlas Imperial Diesel Engine Co.) *Product Eng.,* Vol. 8, Mar. 1937, pp. 89-83. Compositions of Swedish steel, C steel and music wire used for spring manufacture are given with the mechanical properties and endurance limits for different working stresses. Ha (11b)

Alloys and Alloy Steels in 1936. JAMES C. VIGNOS. *Blast Furnace & Steel Plant,* Vol. 25, Jan. 1937, pages 74-75. *Heat Treating & Forging,* Vol. 23, Jan. 1937, pp. 25-26. Summarizes developments. Among subjects considered are low-alloy high-tensile steels, grain size, use of Cu in steel and gray Fe, stainless steels (particularly substitution of Mn for Ni) and deoxidation. MS (11b)

Internal Stresses in Steel. R. HUNTER. *Metal Treatment,* Vol. 2, Winter 1936, pp. 165-170. Review. The production of internal stresses in steel as a result of cold drawing, of heat treatment, of transformations, and of welding is discussed. 9 references. JCC (11b)

Metallurgical Aspects of Alloy Steel for Refinery Equipment. E. R. JOHNSON, C. C. SNYDER & V. W. WHITMER (Republic Steel Corp.). *Refiner Natural Gasoline Mfr.,* Vol. 16, Mar. 1937, pp. 113-116. Comprehensive general discussion of plain C, low-alloy, semi-stainless, stainless and heat-resisting alloys in refinery service, their physical properties and particular applications. VVK (11b)

The Effect of Additions of Nitrogen on the Properties of High Chromium-iron Alloys. J. A. JONES (United Steel Companies, Ltd.). *Metallurgist* (Suppl. to *Engineer*), Feb. 28, 1936, pp. 109-111. The effect of the addition of .2% N to 18, 22 and 28% Cr irons was investigated, in view of the results by Russell Franks in America, with the following results. It was confirmed that the addition of about .2% N to 18% Cr irons renders the alloys hardenable in a similar manner to the addition of about 2% Ni or an increase in C content. The difficulties of manipulation of such hardenable N-bearing Cr irons was found to be greater than those met with in similar irons containing Ni. N produces grain refinement in high Cr irons. Addition of N was found to produce an improvement in notched bar impact figures in the 22% Cr alloys whilst susceptibility to embrittlement during exposure at high temperatures is reduced to some extent. VVK (11b)

12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

The abstracts in this section are prepared in co-operation with the Joint High Temperature Committee of the A.S.M.E. and the A.S.T.M. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor

H. C. CROSS, SECTION EDITOR

Factors in High-pressure Design. C. W. SEIBEL (U. S. Bur. Mines). *Ind. Eng. Chem.*, Vol. 29, Apr. 1937, pp. 414-420. Useful data compilation of effect of liquid-air temperatures on tensile properties of commercial metals, such as Sn alloys, Cu-base alloys, Ni alloy, Cu steels. Properties of alloy steels for high-pressure equipment at higher temperatures, factors of safety, and safety measures are discussed. 32 references. MEH (12)

Intermediate Alloy Steels for High Temperature Application. S. D. WILLIAMS (Timken Roller Bearing Co.). *Refiner Natural Gasoline Mfr.*, Vol. 16, Mar. 1937, pp. 117-118. Review. Alloy steels for refinery service now are being designed on an economic basis. The addition of Cr is used to provide corrosion resistance, Si increases oxidation resistance, Mo acts to inhibit temper brittleness as well as to increase creep strength, Ti or Cb prevents air hardening in 4-6 Cr-Mo steels. Data are given for these low-alloy steels for oxidation, creep and corrosion resistance. VVK (12)

Heat Resisting Chromium-manganese Steels (Hitzebeständige Chrom-Mangan-Stähle) M. SCHMIDT & H. LEGAT. *Arch. Eisenhüttenw.*, Vol. 10, Jan. 1937, pp. 297-306. Original research. Steels of 0.2% C, up to 35% Mn and 30% Cr were studied to determine the best composition range of the Cr-Mn steels for heat resistance. Good heat resisting properties at temperatures of about 825° C. were obtained in a 16% Cr, 17% Mn alloy. In the discussion various experimenters describe their experiences with Cr-Mn alloys. SA (12)

Testing The Growth of Cast Iron (Prüfung des Gusseisens auf seine Wachstumbestandigkeit) E. SCHEIL. *Arch. Eisenhüttenw.*, Vol. 10, Sept. 1936, pp. 111-113. The specimen of the thickness to be used in service should be heated repeatedly above the Ac_1 temperature with access to air. SE (12)

Influence of Time at 1000° F. on the Characteristics of Carbon Steel. A. E. WHITE, C. L. CLARK & R. L. WILSON. *Proc. Am. Soc. Testing Materials*, Vol. 36, Pt. II, 1936, pp. 139-156; discussion pp. 157-160. Original research. Describes extended-time creep tests at 1000° F. on an annealed electric furnace 0.15% C steel. The stresses were so selected that rupture of the specimens occurred after different intervals of time in the series of tests, and fractures have actually been obtained in periods up to 14,000 hrs. The complete time-elongation curves are thus available, permitting the arrangement of the results to show the influence of time of test on the reported creep stresses. C steel loses considerable ductility after prolonged heating under stress at 1000° F., due to intergranular oxidation at the surface. Evidence is also presented to show that (1) the type of fracture varies depending on whether the temperature of test is above or below the lowest temperature of recrystallization, (2) spheroidization will occur in plain C steel under stress at 1000° F., and (3) remanent strain-hardening is manifested in this steel at 1000° F. only when the time for rupture is short, as in the short-time tension test. See also *Metals and Alloys*, Vol. 6, Dec. 1935, p. MA 511L/2. VVK (12)

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Some Creep Tests on Lead and Lead Alloys. ALBERT J. PHILLIPS. *Proc. Am. Soc. Testing Materials,* Vol. 36, Pt. II, 1936, pp. 170-182, discussion, pp. 183-193. Original research. Creep test data on Pb and Pb alloys from tests of 3 yrs. duration are presented to show that it is unsafe to extrapolate creep rates calculated from tests of less than one yr. duration. A considerable range of creep rates for commercial leads may be experienced, probably depending upon uncontrolled variations in the preparation of test specimens. Creep rates of many Pb alloys vary tremendously with the fabrication and heat treatment. Tension tests offer no indication of creep resistance. Improved creep resistance may be imparted by "precipitation-hardening" treatment even when such treatment has no apparent effect upon other properties. Many alloying elements which increase the tensile strength of Pb decrease the resistance to creep under low loads. Cu added to Pb improves the creep resistance very markedly. At low loads Sb lowers the creep resistance. In the age-hardened condition elongation under fairly high tensile loads is low but brittle fractures occurred at less than 1% elongation. Sn likewise lowers the creep resistance of Pb but in the heat-treated condition the alloy shows excellent creep resistance without serious loss in ductility. Te added to Pb lowers its creep resistance under low loads in both the as-rolled and annealed condition. VVK (12)

Fine-grained Structural Steels for Low-temperature Pressure-vessel Service. A. B. KINZEL, WALTER CRAFTS & JOHN J. EGAN (Union Carbide & Carbon Research Labs.) *Metals Tech.,* Vol. 4, Feb. 1937, T.P. 800, 24 pp. Original research. Notched-bar impact tests on S.A.E. 1020 Al-killed steel indicated that resistance at low temperatures falls into various energy levels. This results from the nature of the material and not from minor variations in preparation of specimens and test procedure. The type of fracture of tensile tests at low temperatures shows some correspondence with discontinuous low-temperature impact values. Al, V, Zr, and Cb when added to C or low-alloy steels in sufficient amounts to produce grain refinement result in improved retention of impact strength at low temperatures. Al-killed, normalized, C steels of otherwise appropriate analysis, in small sections are satisfactory for engineering service at temperatures down to minus 80° C. Cr-Cu Al-killed low-alloy steels are satisfactory down to minus 100° C. and may be used in larger sections. Welds produced with C and low-alloy steel electrodes having a combustible or mineral coating show sufficient energy absorption at low temperatures to indicate their fitness for engineering service at temperatures down to minus 80° C. Material in the scarf is likewise suitable. JLG (12)

Intermediate Steels for Refinery Service—Croloy 2 and Croloy 3-M. H. D. NEWELL (Babcock & Wilson Tube Co.). *Refiner Natural Gasoline Mfr.,* Vol. 16, Mar. 1937, pp. 108-112. See *Metals and Alloys,* Vol. 7, May 1936, p. MA 261L/3. VVK (12)

Effect of Previous Heating and Time of Loading on Creep-test Results (Einfluss von Vorwärm-und Vorlastzeit auf das Ergebnis des Dauerstandversuches) R. MAILÄNDER & W. RUTTMANN. *Arch. Eisenhüttenw.,* Vol. 10, Feb. 1937, pp. 359-368. Original research. Previous heating and loading of creep-test specimens, as recommended by the Ver. deut. Eisenhüttenleute, were found to decrease the rate of creep. The reduction in creep was greater, the higher the temperature and longer the time of previous heating. The effect was not attributed to any hardening by deformation, but to the strengthening of the specimens, because of nitriding in the nitrite and nitrate salt baths used for preheating. SE (12)

Theory of Creep and the Action of Combined Stresses as Applied to High Temperature Machinery. FOLKE K. G. ODQUIST. *Ing. Vetenskaps Akad. Handl.,* 1936, No. 141, pp. 1-31. In English. Mathematical treatise. Part of the paper was communicated to the IV Congr. Applied Mech., Cambridge. Investigation applies to the creep of solids at temperatures well above the recrystallization temperature. The present approach to the problem of creep of metals is made from the point of view of theoretical mechanics. EF (12)

Effect of Internal Thermal Stresses on Endurance Limit (Einfluss von Wärme-Eigenspannungen auf die Dauerfestigkeit) A. THUM & A. ERKER. *Z. Ver. deut. Ing.,* Vol. 81, Feb. 27, 1937, pp. 276-278. Review. Internal thermal stresses affect endurance limit of a material just as do stresses mechanically induced; this effect can, according to the direction of the stress component, be favorable or harmful with reference to the endurance limit. The effect is permanent if creep, which could remove the internal stresses entirely or in part is absent. The conditions necessary for creep, and possible utilization for practical purposes, are discussed. 9 references. Ha (12)

13. CORROSION AND WEAR

V. V. KENDALL, SECTION EDITOR

Raw Rubber Coating Used to Prevent Pipe-line Corrosion. L. E. BREDBERG (Staff). *Oil Gas J.,* Vol. 35, Jan. 7, 1937, p. 37. Several gas and oil companies are experimenting with a raw rubber coating for protection of pipe lines against corrosion. After cleaning, rubber cement is applied to the pipe. This is followed by spiral wrapped raw rubber to give a coating .038" thick. A curing solution is applied and allowed to dry for 24 hrs. The coating shows considerable promise although hand-applied and somewhat expensive at present. VVK (13)

New Japanese Acid Resisting Alloy. *Heat Treating Forging,* Vol. 23, Mar. 1937, p. 121. *Iron Age,* Vol. 139, Mar. 11, 1937, p. 44. Alloy steel highly resistant to HCl contains Mo, Cr, and Ni. Invented by Endo, of Tohoku Imp. Univ. Several types are made and are designated Nemicle F, Nemicle C, Nemicle, and Necomicle. Last 3 are much more resistant to acids than first, which is claimed to be more resistant to acids than Hastelloy. MS + VSP (13)

Surface Oxide Films. E. J. W. VERWEY & J. H. DE BOER. *Recueil des Travaux des Pays-Bas,* Vol. 55, July 15, 1936, pp. 675-687. In English. All metals and semi-metallic materials (C) are covered in the presence of oxygen with a monatomic layer of O atoms. The surface molecules are assumed to be usually atomic molecules (e.g. on the alkaline earth metals) and not sufficiently polar to produce a double layer of several volts with an external negative side. This double layer changes the polarity in an electrolytic double layer in such fashion that even in the case of strongly electropositive metals a negative potential results. There are characteristic differences in the activation energy of the formation reaction of the surface oxide. and a study of this activation energy was made. EF (13)

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Corrosive Effects of Soils on Pipes. Coating of Pipes with Bituminous Compositions. First Report of the Dutch Corrosion Committee II for the Study of the Corrosive Effect of Soils on Pipes (Mededeeling No. 5. Eerste Verslag van Corrosie Commissie II voor de Bestudeering van Buisaantasting door Bodeminvloeden). *Centrale Corrosie Commissie. Stichting voor Materiaalonderzoek,* Feb. 1934, 61 pp. In 1931 the "Stichting voor Materiaalonderzoek" (Research Institute for Materials) set up the Central Corrosion Committee for the study of the corrosive effect of soils on pipes. It has made two reports, No. 5 and No. 10. In investigating the coatings on cast Fe pipes, it was found that the coatings had not afforded an effective protection against corrosion, even those that had been stored on the site showing severe rusting and those examined in the soil showing graphitization after only a few years. Coatings consisted primarily of coal tar of from .05 to .10 mm. thickness. Neither did coatings protect steel pipe. Tests for protective coatings designed and recommended for manufacturers were (1) hydrochloric acid test (determination of quantity of iron dissolved by .02 *N* HCl at room temperature for 17 hrs.) (2) ferroxyl test (applied either as melted gelatine layer or as damp impregnated filter paper). Investigation of odor and taste imparted to the water by protective coatings showed only two out of six makes (manufacturers) positive. For gas pipes an inside bituminous coating was considered undesirable and the application of a thin layer of linseed oil was recommended to prevent rusting during storage. Further investigation is outlined. **Second Report of the Dutch Corrosion Committee II for the Study of the Corrosive Effect of Soils on Pipes. Action of Soils on Iron Pipes (Mededeeling No. 10 Tweede Verslag van Corrosie Commissie II voor de Bestudeering van Buisaantasting door Bodeminvloeden).** July 1935, 156 pp. A very comprehensive review of the various papers concerned with the Bur. Standards soil corrosion investigation (American) is given with the general conclusion that most of the results do not apply to soils in The Netherlands. Replies to a questionnaire sent to water- and gasworks in 1931 produced the following conclusions: In sand soils there seems to be little risk of serious attack; serious attack does not occur in clay and peat soils although many pipe owners had not experienced serious attack of pipes in clay soil; time before first corrosion was observed varied from 1 to 30 years; corrosion of cast Fe generally occurred in the form of graphitic softening and the coating of pipes with bituminous compositions was often reported as being insufficient; of late years steel pipes with protective coating are more widely used—opinions differ as to whether these pipes are preferable to cast Fe; where the soil consists of clay or peat many operators lay pipe lines in a trench of sand with both favorable and unfavorable results, in the case of a soft soil the sand soon sinking away in the soil. To determine the reactions actually happening at the surface of the pipe, the crusts formed by corrosion on the pipe were examined. Soils were then differentiated according to whether the soil around the pipe is (1) permanently aerobic which condition occurs in sand soil, in pipe laid at small depth and in pipe always above ground water and which is usually characterized by absence of sulphides, formation of crust on pipe and the presence of Fe in ferric form in the corrosion product; (2) permanently anaerobic which condition occurs in bog and clay soil, in pipe laid at great depth, and in pipe always in ground water and which is usually characterized by presence of sulphides, by products of corrosion generally found at some distance from the pipe with no formation of crust, by presence of Fe in ferrous form in the corrosion product; (3) alternately aerobic and anaerobic which condition occurs in pipe alternately above and in the ground water and which is characterized generally by a highly acid reaction in soils containing calcium carbonate by formation of crust, the crust showing a highly acid reaction where soil contains no calcium carbonate and by the presence of both ferrous and ferric compounds in the crust. Severe graphitization of cast Fe in anaerobic soil and the presence of Fe sulphide in the soil around the pipe was explained as follows: The reduction of sulphate to sulphide in the soil occurs in the total absence of O by the aid of a certain perfectly anaerobic bacterium, the sulphate O reducing the bound or atomical H from the organic food of the bacterium to water. The sulphate O can also bind the H_2 released by solution of Fe. From the fact that the corrosion product is only partly Fe sulphide and that no H_2 is evolved in the reaction, the H_2S formed in the sulphate reduction does not itself attack massive Fe under anaerobic soil conditions. Appendices give the experimental results in detail. VVK (13)

Reconditioning Technique Has Improved in the Last Five Years. MITCHELL TUCKER. *Oil Gas J.*, Vol. 35, Sept. 24, 1936, pp. 101-105. Description of the reconditioning of the trunk lines of a major operating company in the Mid-continent field. The work has consisted of uncovering, raising, cleaning, inspecting, welding, patching, half soling, sleeving, wrapping, coating, and lowering and backfilling. All operations have been carried on while lines were in service and under full pressure. VVK (13)

Fourth Report of the Corrosion Committee. *Iron & Steel Inst.*, Special Report, No. 13, Sept. 1936, 240 pp. **Section A.—Introduction**—outlines the work of the Committee. **Section B. Discussion of Various Problems Bearing on the Corrosion of Iron and Steel, in the Light of the Committee's Experimental Results and of Available Knowledge.** Summarizes and gives conclusions from wrought Fe, mild steel, ingot Fe and Cu-steel, of from 16 days to 5 yrs. show superiority of 30% for Cu-steel, wrought Fe less corrs. show superiority of 30% for Cu-steel, wrought Fe less corroded and ingot Fe more corroded than mild steel. Rolling scale on wrought Fe is more resistant to weathering. Life of galvanized coating (2 oz./ft.^{2}) varies from 1 to 150 yrs. depending on locality. Generally the problems of marine corrosion resolve themselves into one of maintenance. Present day steel is not inferior to prewar steel in resistance to corrosion. The priming coat of paint should be of an inhibitive character, red lead seems to be best at present. **Section C. The Committee's Field Tests on Atmospheric Corrosion.** J. C. HUDSON. Progress report of the Committee's field tests on the atmospheric corrosion of mild steel, Cu-steel, ingot Fe, wrought Fe and low-alloy steel. Quantitative results are given for several of the 14 stations. In general, the data indicate what are to be taken as the normal rates of corrosion of ordinary ferrous metals when freely exposed to the atmosphere in various parts of the world, and they also bring out certain differences in the behavior of the individual materials, in both the unpainted and painted conditions. **Section D. Marine Corrosion** Contains the following papers: **Observations on Steel Plates Built into the Barge Cactus.** J. C. HUDSON & T. A. BANFIELD; **Tests on Steel Plates Built into H.M.S. Basset.** J. C. HUDSON & T. A. BANFIELD; **Exposure Tests at Gosport—Preliminary Results.** J. C. HUDSON & T. A. BANFIELD; **Inspection of Ships; and Examination of One of the Steel Pontoons Supporting the Landing Stage at Gosport.** R. H. MYERS & T. A. BANFIELD. **Section E. Laboratory Research Subcommittee. Subsidiary Corrosion Tests on the Low-alloy Structural Steels Exposed in Part III of the Corrosion Committee's Experimental Programme.** W. H. HATFIELD, H. T. SHIRLEY, T. SWINDEN. W. W. STEVENSON, J. C. HUDSON & T. A. BANFIELD. The intermittent-spray method conducted in three different laboratories on 8 structural steels did not give a satisfactory indication of their relative resistance to atmospheric corrosion. 1% Cr increased resistance of mild steel to atmospheric corrosion. Effects of Cr and Cu were supplementary but not additive. Rolling procedure affected rate of rusting to a comparatively small extent. **Atmospheric Rusting and Descaling of Steel.** R. S. THORNHILL & U. R. EVANS. The "rust-covered area" of steel carrying its millscale exposed to the atmosphere affords no measure of the "descaled area." **A Note on the Relative Efficiency of Restrainers in the Pickling of Carbon Steels.** T. SWINDEN & W. W. STEVENSON. Proprietary inhibitors were tested. Inhibitors are necessary with H_2SO_4 but are unnecessary with cold HCl. Life of inhibitor must be considered. **Subsidiary Tests at Birmingham and Farnborough on Painted and Unpainted Specimens.** J. C. HUDSON. At Birmingham after 4 yrs. paints applied to small specimens over a pickled surface were superior to those painted over a weathered surface. Inhibitive type paint primers were superior to other primers. Some advantage accrued by washing and/or heating weathered surfaces prior to painting. Unpainted ground 18-8 Cr-Ni steel was practically unaffected after 5 yrs. exposure. Staffordshire wrought Fe, rail steel, and .2 and .5% Cu-steel all lost 20% less weight than ordinary mild steel. Ingot Fe was 25% more corroded than mild steel. At Farnborough all paint specimens were in reasonably good condition after 5 yrs. **Tests on the Ageing of Mild Steel Wire.** J. C. HUDSON. Determinations of the breaking load of hard-drawn mild steel wire, made in 6 different laboratories, showed that the average value had increased on ageing for 2 yrs., in the case of both 3½ and 10 S.W.G. wires. Results of determinations of the percentage elongation were less definite, and showed no appreciable change between 1 and 2 yrs., although the value for the 3½ S.W.G. wire has probably decreased since the tests commenced. **The Design, Interpretation, and Uses of Standard Corrosion Tests in Salt Solutions and Industrial Waters—Part II.** G. D. BENGOUGH & F. WORMWELL. Experiments in stagnant neutral salt solutions under high pressures of oxygen give corrosion-time curves similar in form and slope to those obtained in slowly moving solutions at ordinary atmospheric pressure. It is, therefore, possible to carry out accelerated tests in 20 days or possibly less under strictly controlled conditions at high pressures of oxygen. **Section F. Sub-Committee on Protective Coatings.** Reports the organization of a new sub-committee. **Section G. Summary of Memoranda and Other Information Submitted to the Committee.** Reports results of some service tests and industrial behavior of steels. For abstract of previous report, see *Metals and Alloys*, Vol. 6, Aug. 1935, p. MA 336R/1. JLG + VVK (13)

Scaling of Mild Steel in Furnaces. C. H. S. TUPHOLME. *Heat Treating Forging*, Vol. 22, Apr. 1936, pp. 182-184. See *Metals and Alloys*, Vol. 8, May, 1937, p. MA 305L/2. MS (13)

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Corrosion-fatigue in Colliery Ropes. S. M. DIXON & M. A. HOGAN. *Engineer,* Vol. 160, Oct. 25, 1935, pp. 436-437. See *Metals and Alloys,* Vol. 6, Oct. 1935, p. MA 419R/6. LHM (13)

6 **Corrosion-resistant Materials.** E. NORLIN. *Chem. Trade J.,* Vol. 99, July 24, 1936, pp. 63-64. Describes experience of the Swedish chemical industry with stainless steels and non-ferrous alloys. MS (13)

The Cause and Prevention of Steam Turbine Blade Deposits. F. G. STRAUB. *Univ. Illinois Bull.* No. 36, Vol. 33, May 5, 1936, pp. 1-50. The results of exhaustive experiments into the causes
7 of fouling of turbine blades are summarized. The deposits are caused, irrespective of the turbine blade material, by chemicals carried into the steam from the boiler water, particularly by NaOH. Certain inorganic salts, such as sulphates, chlorides and carbonates, if present in sufficient amounts, will prevent fouling, and certain organic salts such as pyrogallol, Na benzoate and Na gallate have the same effect if present in sufficient amounts. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 106R/4. Ha (13)

8 **Phosphate Process Increases Corrosion Resistance of Zinc.** *Steel,* Vol. 99, Sept. 7, 1936, p. 50. Describes Bonderite "Z" process. See *Metals and Alloys,* Vol. 7, Sept 1936, p. MA 481. MS (13)

Economic Significance of Improved Pipe Linings. F. A. BARBOUR. *J. Am. Water Works Assoc.,* Vol. 28, Sept. 1936, pp. 1344-1347. Review of the report of the New England Water
9 Works Committee from the viewpoint of the economics of pipe linings with a plea for a better cast iron pipe lining than the present coal tar dip. VVK (13)

Chemical Plant; Utilization of Aluminium. A. J. V. UNDERWOOD. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 51. Discusses subject from point of view of resistance of Al to corrosion by various chemicals. MS (13)

10 **Corrosion and Pumping Encountered in the Smackover Field.** MITCHELL TUCKER. *Oil Gas J.,* Vol. 35, Nov. 26, 1936, pp. 42-44. The very severe pumping and corrosion problems in the Smackover oil field are discussed and experience in preventive measures recounted. VVK (13)

14. APPLICATION OF METALS AND ALLOYS

New Materials for Residence Water Pipes (Neue Baustoffe für Hauswasserleitungen) H. RODIEK. *Gas- u. Wasserfach,* Vol. 28, Feb. 6, 1937, pp. 88-91. Review. Attempts are being made to replace the (in Germany) expensive Pb and Cu pipes by steel in domestic plumbing. Steel pipes must be provided with internal protection, either bituminous or by galvanizing, bituminous coating is, however, too uncertain for small pipes. Phosphating methods are satisfactory, especially if a subsequent lacquer layer is applied. Al (even pure Al) was unsatisfactory because of mechanical difficulties with joints and corrosion at joints through galvanic action. Ha (14)

Theory of Supra-conductivity (Zur Theorie der Supraleitfähigkeit) L. LANDAU (Phys. Tech. Inst. Charkow). *Physik Z. Sowjetunion,* Vol. 11, No. 2, 1937, pp. 129-140. In German. Theoretical research. It is shown that with a certain mean value —other than O—of the magnetic field, a supra-conductor is not subdivided into 2 regions (one supra-conductant and the other normal) but that a great number of layers exist which are alternately supraconductant and normal. This phenomenon furnishes an explanation for the transitional state found by Peierls (Proc. Roy. Soc., Vol. 155, 1936, p. 613). EF (14)

Powder Metallurgy Presents Broad Field for Experimental Development. G. J. COMSTOCK (Handy & Harman Co.). *Steel,* Vol. 100, Mar. 29, 1937, p. 48. Includes discussion. General survey of field, with forecast. See *Metals and Alloys,* Vol. 7, Oct. 1936, p. MA 510L/2. MS (14)

Wire Ropes Research in Relation to Colliery Practice. M. A. HOGAN. *Trans. Inst. Mining Engrs.,* Vol. 91, June 1936, pp. 196-219. *Iron & Coal Trades Rev.,* Vol. 134, Apr. 16, 1937, p. 695. General review. See *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 370R/3. AHE (14)

Cast Moulds for the Glass Industry. R. D. SMITH. *Foundry Trade J.,* Vol. 55, Dec. 31, 1936, pp. 501, 502, 504. This article is taken from *Metals and Alloys,* (Vol. 7, Sept. 1936, pp. 217-220; Oct. 1936, pp. 263-268) where it bore the title of "Metallurgical Needs of the Glass Industry." AIK (14)

14a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

Experiments with Domestic Materials in the Construction of Water Pipe Lines (Versuche mit Heimstoffen im Wasserleitungsbau) R. SCHEMEL & S. CLODIUS. *Gas- u. Wasserfach,* Vol. 80. Mar. 6, 1937, pp. 151-157; Mar. 20, 1937, pp. 187-191. Original research. Experiments with Al instead of Pb as packing material for sleeve joints are described. The Al was used as foil, corrugated, or wool and compared with lead. The tests showed that Al can safely be applied. No corrosion difficulty should be encountered if the following points are observed: the packing material must consist of Al of at least 99.3% purity and must be caulked as tightly as possible; the minimum dimensions of the threads in Al wool must be 0.05 x 0.2 min.; Al foil must be used only with smooth surface and of a thickness at least 0.03 mm. The tests, especially those for corrosion, are described in detail. Ha (14a)

Designing Soft Copper Gaskets for High Pressure Equipment. WILLIAM L. EDWARDS (U. S. Dept. Agriculture). *Chem. & Met. Eng.,* Vol. 44, Mar. 1937, pp. 134-137. Design information is given for the use of copper gaskets for working pressures up to and over 15,000 lbs./in.^{2} PRK (14a)

Experience on Pressure Tanks Made of Light Metal Alloys: Lautal, Bondur and Duralumin (Erfahrungen mit Gasflaschen aus Leichtmetallen: Lautal, Bondur und Duraluminium) N. CHRISTMANN. *Wärme,* Vol. 60, Apr. 10, 1937, pp. 236-237. Continues previous research (see *Metals and Alloys,* Vol. 8, May 1937, p. MA 307L/1). Suggests that the inside protective coating of light metal pressure tanks should be applied after the official hydraulic test has been performed. Shrinking on of steel collar prevents leakages between valve and tank. EF (14a)

Use Bronze Casting for Repairs. N. K. B. PATCH. *Foundry,* Vol. 65, Mar. 1937, p. 84. Practical discussion of the use of bronze or brass casting in place of malleable Fe casting. Given the composition and properties of a few bronze castings. VSP (14a)

Aircraft; Unique Position of Aluminium. H. SUTTON. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 48. Deals with use of Al alloys in aircraft construction. MS (14a)

Bottle Closures; Use of Aluminium Seals. W. R. GAMBLE. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 52. Describes types and methods of manufacture. MS (14a)

Aluminium in the Dairy; Growing Use in Denmark. PETER B. MÜRER. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 56. MS (14a)

Brewery Equipment; Storage and Transport of Beer. PETER B. MÜRER. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 56. Deals with use of Al for vats, tanks, barrels, and miscellaneous equipment. MS (14a)

Textile Industries; Rapidly Extending Uses. J. F. CROWLEY. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 55. Discusses applications of Al and its alloys. MS (14a)

Excavating and Mining; Reducing Weight of Dippers. S. E. CLOTWORTHY. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 40. Discusses use of Al alloys in construction of excavating equipment and mine skips and cages. MS (14a)

Zinc Die Castings. H. CHASE. *Automobile Eng.,* Vol. 26, Dec. 1936, pp. 496-500. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 236L/6. Ha (14a)

Printing Industry; Evolution of Aluminium Inks. D. H. CALDWELL. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 44. MS (14a)

Sterile Wrappers; Uses of Aluminium Foil. C. BLATTNER. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 59. Describes method of rolling foil and its use for wrapping, electrical condensers, thermal insulation, and coffee growing. MS (14a)

Copper Stools for Ingot Molds Find Increasing Applications. H. B. KINNEAR. *Mining and Met.,* Vol. 17, June 1936, pp. 289-290. See *Metals and Alloys,* Vol. 7, June 1936, p. MA 285R/8. VSP (14a)

Hydronalium Castings (Hydronalium-Guss). P. SPITALER. *Aluminium,* Vol. 18, Sept. 1936, pp. 429-432. See *Metals and Alloys,* Vol. 7, Sept. 1936, p. MA 464R/1. Ha (14a)

Laundry Industry; Aluminium Fittings. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 39. Deals with use of Al in construction of laundry equipment. MS (14a)

Containers; Some Novel Applications. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 34. Deals briefly with some smaller applications of Al. MS (14a)

Bridgework and Dams; Aluminium in Large Scale Structures. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 40. Includes consideration of structural use of Al alloys in aircraft and trucks. MS (14a)

Machine Tool Design; Growing Field of Application. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 44. Discusses use of Al and its alloys for machine-tool components. MS (14a)

Mechanical Construction; Advantages of Light Alloys. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 44. Discusses use of Al and its alloys in construction of machines. MS (14a)

Wireless; Modern Receiving Sets. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 42. Describes use of Al and its alloys in construction of radio equipment. MS (14a)

14b. Ferrous

M. GENSAMER, SECTION EDITOR

Die Costs Cut with Graphitic Steels. F. R. BONTE (Timken Roller Bearing Co.). *Am. Machinist,* Vol. 81, Mar. 10, 1937, pp. 207-208. Tests with graphitic steels that were heat-treated and quenched in oil from 1550-1600° F. and in water from 1500° F. and developed a fully martensitic structure with free graphite, gave excellent results for use as dies. These steels are easily forged below 2000° F., readily machinable, able to develop high surface hardness by simple heat treatment, and resistant to repeated impact. The number of pieces that can be worked with them without regrinding may be increased from twice to 50 times. Ha (14b)

Developments in Graphitic Steel for Tools & Dies. F. R. BONTE & MARTIN FLEISCHMANN (Timken Roller Bearing Co.). *Metal Progress,* Vol. 31, Apr. 1937, pp. 409-413. Information on the properties of a newly developed steel. Si is used in this steel, about 1% to control the graphitization. Slow cooling from annealing temperature reduces the combined carbon, the higher the temperature the higher the graphite content. Air cooling results in slight increase in combined carbon, higher at higher temperatures. Quench results in very excellent properties and service shows 2 to 10 times the life of C steel in a wide range of die applications. Mo may be added, 0.25-0.30% to make an oil hardening graphitic steel. WLC (14b)

The Manufacture and Applications of Steel Tubes (La Tube d'Acier, sa Fabrication et ses Applications) CHAS. GILLETT (Soc. des Tubes de Valenciennes). *Usine,* Vol. 46, Apr. 15, 1937, p. 31. Methods for producing steel tubes with and without seams are briefly described. Ha (14b)

Stainless Steel for Vehicle and Aircraft Construction. A Study of Properties and Applications. R. G. GRIFFIN. *Commonwealth Engr.,* Vol. 24, Sept. 1, 1936, pp. 67-71; Oct. 1, 1936, pp. 101-106. An extended review including many numerical values of British stainless steels. The welding and design of stainless steel structures is emphasized. EF (14b)

Rail Materials (Zum Stande der Schienenbaustoffrage) BERCHTENBREITER. *Organ Fortschr. Eisenbahnw.,* Vol. 92, Feb. 1, 1937, pp. 52-57. Up-to-date review covering the following:
1 rail stresses, developments in the manufacture of rails, rail welding and testing methods. A low alloy, .2% C steel with slightly higher Si and Mn content is customary. Its resistance against wear is quite noteworthy. The tendency in general, however, is towards high tensile rail steels and compound rails. Vanadium
— steels with .3-.34% V of 115,000-140,000 lbs./in.², high impact strength and wear resistance, favorable elongation and weldability have been developed in Europe in addition to Mn (over 1.0% Mn) and Cr (.5-1.0% Cr) electro-steels, Thomas and open-hearth
2 steels. Cr, Mn and Mo are widely used as hardeners and for reduction of wear. Mo improves also endurance bending strength. The workability of the standard austenitic Mn steel with 14% Mn used for crossings, frogs, etc., has been improved. EF (14b)

— **Metallurgical Development and Shipbuilding.** *J. Comm. Shipbldg. & Eng. Ed.,* Feb. 4, 1937, pp. 1-2. Up-to-date review. Consideration is given to the development of 29/9 and 39/10 Cr-Ni alloys, Al-Cr-Ni alloys, and pearlitic Ni steels for corrosion and
3 heat-resisting purposes, to the development of B steels for corrosion and wear resistance and of Mn-Cr-V steels for machinery, to new methods for manufacturing stainless steel wire and of cladding steel with Ni-Cr (austenitic) and Ni coatings, and to
— the development of V-Cr, V-Mn, and V-Ni steel castings. Reference is also made to improvements in W carbide tools and welding electrodes, to a new method of heat treating bolts, and to the use of Cu-Mo steels for atmospheric corrosion and Si-V steels for springs. JWD (14b)
4

"Roneusil," A Silvery, Rustless Alloy Steel for the Cutlery and Tableware Industries ("Roneusil," Eine silberfarbene, rostfreie Stahlegierung für die Besteck- und Tafelgeräte-Industrie) K. FUCHS. *Metallwirtschaft,* Vol. 16, Feb. 26, 1937, pp. 215-220. Descriptive of the uses and properties of a low Cr, high Mn steel, which can be retained in the austenitic state only by fast cooling. The material can be easily rolled, pressed, stamped, and drawn.
5 Cold work decomposes the austenite making it necessary to reanneal and quench the material if corrosion resistance is required. Properly treated the alloy has a tensile strength of from 78,000 to 92,500 lbs./in.² with elongations of from 40 to 60%. In the
— cold worked state tensile strengths of 185,000 lbs./in.² may be attained. Roneusil possesses a silvery color and is resistant to fruit acids, organic acids, dampness and atmospheric corrosion. It is not resistant to strong mineral acids. GA (14b)

6 **Suitability of Various Types of Pipes (Betriebseignung verschiedner Rohrarten)** H. NEHLEP. *Arch. Wärmewirt.,* Vol. 18, Jan. 1937, pp. 13-17. Survey. The choice of a suitable pipe is governed by (a) type of flowing medium (water, steam, gas, etc.),
— (b) pressure, (c) temperature, (d) size, and (e) material of pipe. Materials and methods of construction suitable for various applications are discussed. JZB (14b)

7 **Consumption of Raw Materials in Boiler Construction (Der Werkstoffaufwand in Dampfkesselbau)** E. SCHULZ & O. SCHMIDT. *Arch. Wärmewirt.,* Vol. 18, Feb. 1937, pp. 33-37. Discussion. The technical development of steam boilers is influenced by Germany's lack of raw materials. A standardization of materials and
— parts is recommended as well as the use of Si, Mn, and Al as steel alloys instead of the more expensive Cr, Ni, W, etc., that must be imported. JZB (14b)

8 **The Suitability of Stainless Steel Compared with Other Metals in Bleaching.** JOSEPH E. GOODAVAGE. *Am. Dyestuff Reptr.,* Vol. 26, Feb. 8, 1937, pp. P71-77. Original research. The effect of exposing various metals used in the textile industry to an alkaline hydrogen peroxide solution is investigated. The
— most economical metals for hydrogen peroxide bleach baths are Ni, Al, and Enduro 18-8S; of these Ni and Enduro 18-8S are the most practical. Corrosion, contamination of the bath with undesirable salts or precipitates, and mechanical fitness of the metals were
9 not considered. Stainless steel, soldered with Ag solder varies in its effect on the peroxide bath. Wool has a slight stabilizing effect upon alkaline peroxide bleaching solutions. The tolerance limits of area-volume ratios for several metals are: Cu, 3
— cm.³/100 cc.; Everdur and Monel, less than 4:100 each; and Al, 8:100. Enduro 18-8S is almost as inert as porcelain or glass to peroxide bleaching solutions. WHB (14b)

10 **Hose Couplings Made from Alloy Steel Have Increased Life in Hard Service.** *Steel,* Vol. 100, Mar. 29, 1937, p. 70. Outlines operations at plant of Cleveland Rock Drill Co., Cleveland, O., in manufacturing couplings from bars. Steel contains 0.48% Cr, 1.12% Mn, 0.43% C, and 0.16% Mo. Couplings are heat treated and Cd plated. MS (14b)

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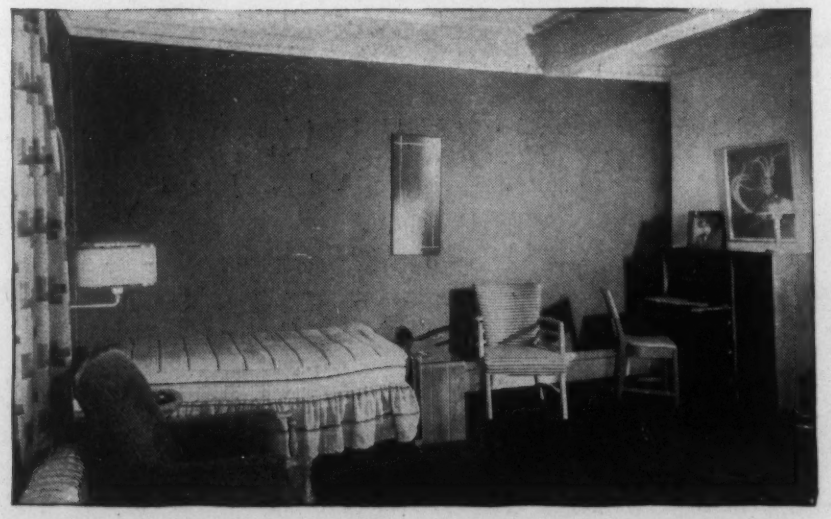

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15. GENERAL

Review of Major Metals. *Eng. Mining J.*, Vol. 138, Feb. 1937, pp. 54-60. **Gold,** H. N. LAURIE, pp. 54-55. **Silver,** DICKSON H. LEAVENS, pp. 55-56. **Copper,** WALTER RENTON INGALLS, p. 57. **Lead,** FELIX E. WORMSER, pp. 57-58. **Zinc,** O. W. ROSKILL, pp. 58-59. **Tin,** E. BALIOL SCOTT, pp. 59-60. **Nickel,** R. C. STANLEY, p. 60. WHB (15)

Half a Century of Steel Merchandising. *Iron Age,* Vol. 139, Feb. 11, 1937, pp. 52-53. Historical description of A. Milne & Co., steel merchandisers. The company began in 1887 and has been in the same business for the past 50 yrs. VSP (15)

Calculating the Speed of Fan for Cupola Operation. *Foundry,* Vol. 65, Jan. 1937, p. 64. By knowing the diam. of a cupola, the type of fan, diam. of pulleys and h.-p. of motor may be calculated. Gives an example. VSP (15)

1937 Directory—Trade Names of Alloy and Special Analysis Irons and Steels. *Steel,* Vol. 100, Jan. 4, 1937, pp. 63-78. Arranged in 2 parts. First consists of compilation of trade-names under each company, with more than 300 American suppliers being arranged alphabetically. Second is an alphabetical list of the significant words or symbols in trade-names. MS (15)

Texas Metalworking Plant Classifies Country Mixed Scrap in Its Own Yard. *Steel,* Vol. 100, Feb. 1, 1937, p. 74. Alamo Iron Works, San Antonio, Texas, finds it profitable to have a complete scrap yard. Describes briefly classification made and equipment. MS (15)

Iron and Steel. *Times Trade & Eng.,* Vol. 40, Jan. 1937, p. 16. Review of developments in the British Fe and steel industry during 1936. MS (15)

Non-ferrous Metals. *Times Trade & Eng.,* Vol. 40, Jan. 1937, p. 17. Reviews developments in powder metallurgy, electrometallurgy, Ni, Ni-Al alloys, rarer metals, and research. MS (15)

Progress Reports—Metallurgical Division. 14. Annual Report of the Metallurgical Division, Fiscal Year 1936. R. S. DEAN. *U. S. Bur. Mines, Rept. of Investigations* No. 3331, Jan. 1937, 49 pp. A summary of research on the following: Combination smelting of Cu and Mn, recovery of S from smelter smoke, electrolytic Mn, treatment of chromite ores, treatment of alunite, reducibility and size preparation of Fe ores, desulphurization, oxides in basic pig Fe and in basic open-hearth steel, flotation of semi-oxidized siliceous Ag-Pb ores, flotation of complex ores, direct metallization of Pb from rich galena concentrates, removal of Bi from Pb bullion, revision of entropy data, large scale experimental production of sponge Fe, heats of fushion from melting point data, density changes in cold-worked materials, low-temperature specific heat investigations, thermodynamic study of the chemistry of Cr chlorides, continuous chlorination of Cr ores, thermodynamic study of S and its important compounds, production of pure H from hydrocarbon gases, roll crushing, the coercimeter, sizing analysis of the circulating load in ball milling, Fe wear in ball mills, flotation of langbeinite, flotation of Vt. talc, chemistry of flotation, concentration of Fe ore, concentration of complex Mo-Va ores, ore testing, metallurgy of Au, recovery of precious-metal ores associated with Pb, Au lost from dredges, flotation of Ag minerals, flotation of scheelite, explosive shattering, production of direct steel, mechanism of steel making, dust settling, coercive force, and physicochemical nature of metallic interfaces. AHE (15)

Technical Control of Plant Operations and the Role of the Laboratory (L'Organisation du Contrôle scientifique des Usines et le Rôle du Laboratoire) P. CHEVENARD. *Rev. Tech. Luxembourg.*, Vol. 28, Sept.-Oct. 1936, pp. 96-100. **On the Function of Science in Works.** IBID. *Engineer,* Vol. 162, Sept. 18, 1936, pp. 279-281. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 180L/10. Ha + VSP (15)

Visit to Messrs. Stewarts and Lloyds' New Steelworks at Corby, Northamptonshire. *J. Inst. Fuel,* Vol. 9, Aug. 1936, pp. 387-401. Descriptive. AHE (15)

The Record of the Metal Industries in 1936. *Metal Ind., N. Y.,* Vol. 35, Jan. 1937, pp. 2-30. General Review. CBJ (15)

Bolts and Nuts Keep Pace with Progress. A. E. R. PETERKA (Lamson & Sessions Co.) *Iron Age,* Vol. 139, Mar. 18, 1937, pp. 34-37. A general review of the progress made in the use of the various metals and methods of manufacture and treatment of bolts and nuts. VSP (15)

Some Recent Developments in Metallurgy. M. S. FISHER. *Mining J. London,* Vol. 196, Feb. 27, 1937, pp. 177-178. General review for mining industry. Summarizes importance of: Grain-size control in steel; "modification" of cast iron; sparkless tools; light-weight mining equipment; Cb for austenitic steel; and Ta carbide for tools. AGS (15)

Trends in Research in the Iron and Steel Industry. ANSON HAYES. *Mining and Met.,* Vol. 18, Feb. 1937, pp. 95-97; *Heat Treating Forging,* Vol. 23, Feb. 1937, pp. 84, 87. Survey, tracing the progress of plant and laboratory research in the steel industry. Noticeable trends include increase in number of well-equipped and well-manned industrial laboratories, greater use of customer's production facilities for investigational purposes, and recognition of research benefits from close contacts between laboratory heads, production men and customers. VSP + MS (15)

Common Sense Cost Estimating. ALBERT E. GROVER. *Foundry,* Vol. 65, Mar. 1937, pp. 31-33, 80. A practical description of a dependable basis for calculating costs of individual jobs in a foundry. Gives method of establishing normal operations especially suited to the needs of jobbing foundries. VSP (15)

Intelligent Planning Cuts Costs. JAMES J. ZIMMERMAN. *Foundry,* Vol. 64, Oct. 1936, pp. 28-29, 77-78; Nov. 1936, pp. 24-25, 73-74. Cost and production principles applied to heavy equipment manufacturing. VSP (15)

15a. Economic

Metal Mining in Nevada, 1936—Advance Summary. CHARLES W. MERRILL. *U. S. Bur. Mines, Mineral Market Repts.,* No. M. M. S. 518, Jan. 30, 1937, 6 pp. Statistical. AHE (15a)

Metal Mining in Oregon, 1936—Advance Summary. CHARLES W. MERRILL. *U. S. Bur. Mines, Mineral Market Repts.,* No. M. M. S. 517, Jan. 30, 1937, 4 pp. Statistical. AHE (15a)

Metal Mining in California, 1936—Advance Summary. CHARLES W. MERRILL. *U. S. Bur. Mines, Mineral Market Repts.,* No. M. M. S. 516, Jan. 30, 1937, 7 pp. Statistical. AHE (15a)

Materials for the Electrical Industry. *Elec. Rev.,* Vol. 120, Jan. 8, 1937, pp. 59-60. Review of 1936 market conditions relative to Cu, Pb, Sn, Zn, Al, and rubber. MS (15a)

Metallurgy of Zinc. U. C. TAINTON. *Mining and Met.,* Vol. 18, Jan. 1937, pp. 17-18. Survey of progress. VSP (15a)

Central Europe in Advance; Russia Floods Iron Market. JAN TILLE. *Steel,* Vol. 100, Jan. 4, 1937, pp. 372-373. Review of iron and steel industry in Russia, Czechoslovakia, Austria, Hungary, and Poland during 1936. Includes statistics on Russian imports and exports of ferrous products for Jan.-Oct. 1936. MS (15a)

A Year of Technical Progress. A. F. WEBBER. *Iron Steel Ind.,* Vol. 10, Jan. 1937, pp. 219-222. Review. CMS (15a)

Harnessing Switzerland's Water; Electrolytic Method of Production. A. VON ZEERLEDER. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 20. Survey of Swiss Al industry. MS (15a)

The Iron Ores of New Jersey. H. M. ROCHE. *Iron Age,* Vol. 139, Feb. 4, 1937, pp. 74-80; Feb. 18, pp. 39-43. Taken from contribution No. 105 of the Am. Inst. Mining Engrs. Deals with history of Fe ore mining in New Jersey, listing reserves and possible markets of this ore, and discusses rôle of Lake Superior and foreign ores in domestic steel production. In final installment emphasizes the metallurgical value, future markets and mining costs of Jersey ores. VSP (15a)

A Special Computer for the Wire Industry. TOM GORE, JR. *Wire & Wire Products,* Vol. 12, Feb. 1937, pp. 73, 107-108. Describes a specially developed instrument for solving wire reduction and wire strength problems with directions for use. Ha (15a)

1

Steel Castings. C. K. EVERITT (Edgar Allen Co.) *Edgar Allen News,* Vol. 15, Mar. 1937, p. 995. The present wide use of steel and alloy steel castings is mentioned and methods of manufacture, especially in British practice, are briefly discussed. Ha (15a)

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Construction and Finishing Practice of Light Metal Castings (Konstruktions- und Fertigungspraxis von Leichtmetall-Gussstücken) W. HARTL. *Aluminium,* Vol. 19, Feb. 1937, pp. 70-86. A number of precautions to be observed in designing light metal castings are discussed in detail and illustrated by numerous examples. Tables of mechanical properties of several light metals are added. 17 references. Ha (15a)

2

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Collects Statistics on Capacity and Output of Commercial Steel Castings. RAYMOND L. COLLIER. *Steel,* Vol. 99, July 13, 1936, p. 56. MS (15a)

3

The Economics of the Iron and Steel Industry. RALPH J. WATKINS. *Iron Age,* Vol. 139, Feb. 18, 1937, pp. 32-38, 86. A summary of the findings of the Bureau of Business Research, University of Pittsburgh. Some of the findings are highly controversial, particularly those relating to labor problems in the Fe and steel industry. VSP (15a)

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Graphic Representation of Aluminum Alloys (Bildliche Darstellung der Aluminium-Legierungen) H. WIESTHALER. *Aluminium,* Vol. 19, Jan. 1937, pp. 11-19. A graphic method of portraying several alloy systems with a common base is described. Each binary system is represented by a vector, the direction of which indicates the alloying constituent, and the length of which gives the amount of the latter. Mechanical properties are also represented as vector. Ha (15a)

4

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Consumption of Tin in the Tin Plate and Terneplate Industry in 1935—Advance Summary. E. W. PEHRSON, J. B. UMHAU & M. E. TROUGHT. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 482, Aug. 5, 1936, 4 pp. Statistical. AHE (15a)

5

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Metal Mining in South Dakota, 1936—Advance Summary. CHAS. W. HENDERSON & A. J. MARTIN. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 505, Jan. 11, 1937, 2 pp. Statistical. AHE (15a)

6

Metal Mining in Wyoming, 1936—Advance Summary. CHAS. W. HENDERSON & A. J. MARTIN. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 504, Jan. 11, 1937, 1 p. Statistical. AHE (15a)

—

Iron Ore Industry in 1936—Advance Summary. ROBERT H. RIDGWAY & H. W. DAVIS. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 511, Jan. 8, 1937, 3 pp. Statistical. AHE (15a)

7

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Consumption of Ferrous Scrap and Pig Iron in the United States in 1935. RICHARD J. LUND & H. W. DAVIS. *U. S. Bur. Mines, Rept. Investigations* No. 3329, Nov. 1936, 16 pp. Statistical. **Scrap Tops Pig Iron as Raw Material in Steel Industry.** IBID. *Steel,* Vol. 99, Nov. 30, 1936, pp. 14-15. **Shows Consumptive of Scrap.** IBID. *Foundry,* Vol. 64, Dec. 1936, pp. 48, 50. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 180L/8. AHE + MS + VSP (15a)

8

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Sweden; Increase in Output. S. KLOUMANN (Norsk Aluminium Co. and A/B Svenska Aluminiumkompaniet) *Times Trade and Eng.,* Vol. 40, Mar. 1937, pp. 33-34. Survey of Swedish Al industry. MS (15a)

9

Pioneers in Norway; Attraction of Cheap Water Power. S. KLOUMANN (Norsk Aluminium Co. and A/B Svenska Aluminiumkompaniet) *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 34. Survey of Norwegian Al industry. See *Metals and Alloys,* Vol. 6, June 1935, p. MA 256R/8. MS (15a)

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Metal Mining in Idaho, 1936—Advance Summary. C. N. GERRY & PAUL LUFF. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 506, Jan. 11, 1937, 3 pp. Statistical. AHE (15a)

10

France's Varied Activities; Cradle of Aluminium Industry. HENRY D'AUVIGNY (L'Aluminium Français) *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 12. Survey of French Al industry.

Effect of the Extent of Operation on the Gas Balance of Blast Furnaces of a Steel Plant (L'Influence du Degree d'Occupation sur le Bilan des Gaz de hauts Fourneaux d'une Usine sidérurgique) M. STEFFES & R. WELTER. *Rev. Tech. Luxembourg.,* Vol. 28, Sept.-Oct. 1936, pp. 87-91. Original research. The thermal balance of gases produced and consumed under the varying operating conditions of a steel plant with blast furnaces, open-hearths and rolling mills is investigated. Certain relations are developed which permit the simple determination of the excess or insufficiency of gas (produced in the blast furnaces) required for a given steel production. Ha (15a)

The American Tungsten Industry. CHAS. H. SEGERSTROM (Nevada-Massachusetts Co.) *Mining Congr. J.,* Vol. 23, Jan. 1937, pp. 50-53, 63. Present resources and production of W are not large enough to supply the entire domestic needs of the U. S. However, there are a large number of domestic deposits which if developed are capable of providing a large potential tonnage of low- grade ore. Most important applications of the metal are in high speed tool steels and hard facing alloys. BHS (15a)

MS (15a)

Developments in Chemistry of Steel Making Discussed in England. T. G. BAMFORD. *Iron Age,* Vol. 138, Nov. 26, 1936, pp. 48-50, 102. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 237R/3. VSP (15a)

Welding Practices Need More Rigid Control. HAROLD F. SHEPHERD (Am. Loco. Co.). *Machine Design,* Vol. 9, Feb. 1937, pp. 41-43. Points out 13 considerations involved in a practical welding design under the following main viewpoints: accessibility, shrinkage, materials, drawings. Regarding materials, low C steel is considered to be "ideal." EF (15a)

Production Data of the Steel Foundry Industry. EDWIN F. CONE (Staff). *Metals and Alloys,* Vol. 8, Apr. 1937, pp. 111-113. Statistical. WLC (15a)

The Development of the Aluminum Industry in the World since the Beginning of this Century (Die Entwicklung der Aluminiumwirtschaft in der Welt seit der Jahrhunderwende) A. DEDERER. *Aluminium,* Vol. 19, Mar. 1937, pp. 210-214. Comprehensive statistics on production and consumption in the most important industrial countries are given, the development of their industries described and consumption of Al, Cu, Pb, Zn and Sn in the world compared. Ha (15a)

German National Conservation of Base Metals and Its Effect upon the Electrical Industry (Die Bewirtschaftung unedler Metalle und ihre Auswirkung auf die Elektrizitätswirtschaft) H. ALMERS. *Elektrizitätswirtschaft,* Vol. 35, Aug. 5, 1936, pp. 579-582; Aug. 15, 1936, pp. 593-597; Sept. 5, 1936, pp. 654-659. Review and interpretation of the latest German laws regulating the use of base metals on a nation-wide scale with particular reference to the electrical industry. EF (15a)

Small-picture Photography in Industry (Die Kleinbildphotographie in der Technik) W. ANDERS. *Giesserei,* Vol. 24, Feb. 12, 1937, pp. 80-83. Attention is called to the advantages which small, but clear pictures ($2\frac{1}{4}'' \times 3\frac{1}{2}''$) can have in illustrating technical processes, special features of certain products, etc. Methods and photographic equipment is described. Ha (15a)

15b. Historical

Metallurgical Development and Engineering Progress. SIR WILLIAM LARKE. *J. Record Trans. Junior Inst. Engrs.,* Vol. 47, Jan. 1937, pp. 125-146. Discusses steels, cast Fe, Cu, Al, Pb, Mg, Ni, Sn, W, Mo, Mn and powder metallurgy. See *Metals and Alloys,* Vol. 8, May 1937, p. MA 309L/5. EF (15b)

Paul Héroult, 1863-1914. J. BALLY. *Rev. l'Aluminium,* Vol. 13, 1936, pp. 357-368. (Special issue.) Biographical. HR (15b)

Operations of International Nickel. J. W. RAWLINS (Intern. Nickel Co.). *Can. Chem. Met.,* Vol. 21, Apr. 1937, pp. 122-126. An historical review. WHB (15b)

The Extraction of Nickel. *Mech. World Eng. Record,* Vol. 101, Apr. 16, 1937, pp. 387-392. Illustrated review tracing Canadian practice of concentration, smelting and refining of Ni. The Ni-carbonyl process is featured. EF (15b)

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PACIFIC COAST SALES REPRESENTATIVE AVAILABLE to metal or equipment manufacturer requiring full or part time representation. Thoroughly experienced in industrial metallurgy, metallic alloys and their applications, and industrial machinery and equipment. Seventeen years on Pacific Coast. Box MA-42.

POSITION WANTED by superintendent of electric furnace department, 10 years' experience in melting all types of alloy steels, research development, heat treating, metallography. Technical graduate, age 36 years, married, now employed. Box MA-44.

POSITION WANTED: Junior Executive Position, either accounting or production, with a small manufacturing concern. A young man with extensive accounting training and experience, including public accounting, and also two year's manufacturing experience with a large tractor firm—one year in the accounting department and one year in the metallurgical laboratory. Single, age 25, will go anywhere and available on short notice. Box MA-47.

WANTED: Superintendent for non-ferrous ingot smelting plant in Great Lakes district. Must be familiar with construction and operation of reverberatory furnace, production of red and yellow alloys, aluminum and white metals. Reply giving complete information as to experience, qualifications and salary expected, will be treated with absolute confidence. Box MA-48.

POSITION WANTED: Physical chemist and metallurgist desires change. Ph.D. in physical chemistry and physical metallurgy. Four years of industrial experience. Six years' experience teaching metallurgy in engineering schools. Will consider either industrial or teaching position. Box MA-49.

WANTED: Young man, acquainted with Brass Foundry Trade in Middle West, to sell non-ferrous ingot as a sideline for an old-established company. Give particulars. Box MA-50.

POSITION WANTED: Metallurgist desires change of location. 18 years' experience in high grade tool steel mills. Thoroughly acquainted with all kinds of tool steels, stainless, etc., including melting, forging, rolling, inspecting, heat treating and testing. Box MA-51.

POSITION WANTED: Well trained metallurgist, last 8 years as chief metallurgist and sales metallurgist with tool steel mill wishes position as sales metallurgist. Box MA-52.

Book Reviews

ETCHING REAGENTS FOR METALLOGRAPHIC WORK *(Reactifs d'Attaque Metallographique)*

Albert Portevin and Paul Bastien

Dunod, Paris, 1937. Paper, 5½ x 8½ in.; 267 pages. Price 89.25 Fr.

Those who are concerned with the preparation of metals for microscopical examination are always aware of the importance of selecting the best etching reagent. They realize also that a very large number of such media have been proposed and that their description is widely scattered in the technical literature. The time consumed and the labor involved in seeking the right formula for their needs in such a mass of dispersed information are very great and in this consideration will be found the inestimable value of the work performed for them by the authors of this book. Not only have they assembled in a most convenient way this scattered information but they have done it with masters' hands and the skill resulting from long experience.

The six chapters deal respectively with the reagents to be used for the micrographic examination of ferrous alloys, the macrographic examination of those alloys, for copper and its alloys, for aluminum, magnesium and light alloys, for tin, lead, cadmium, bismuth and antifriction alloys, for zinc and its alloys, for nickel, chromium and their alloys and for the precious or refractory metals and their alloys.

The composition, application and result are given for each reagent in brief and clear language and no less than 205 etching treatments are described.

The usefulness of the book is greatly enhanced by the addition of three tables of contents in which the reagents are listed (1) according to the names of the proposers (2) according to the metals and alloys to be examined and (3) according to the main constituents of the reagents.

In an introductory chapter under the heading of "Notions Générales" (General Information) the authors describe the means that have been employed to study the nature of the various constituents present in metals and alloys, and the significance of the patterns resulting from different treatments. This includes hardness tests, dilatation, etching figures, etching at elevated temperatures and many other considerations of significance to the metallographist.

That this book will receive the warm and appreciative welcome it deserves is a safe prophecy. It is to be hoped that it will be translated into English.—ALBERT SAUVEUR.

CALCULATIONS FOR CHIP-FORMING MACHINING

(Rechnen an Spanabhebenden Werkzeugmaschinen)

F. Riegel

Julius Springer Verlag, Berlin, 1937. Paper 6¼ x 9½ in., 161 pages. Price 9.60 RM.

Fundamentals of calculation, tapers, threads, dividing heads, and the cutting of forming tools, e.g. hobs, are dealt with in this volume. Schematic diagrams are widely used, and all the operations are reduced to a mathematical basis. It is written entirely for the machine shop man and contains practically nothing on cutting ability of tools or machinability of metals that would help the metallurgist.—H. W. GILLETT.

TIN—MINING AND METALLURGICAL PRODUCTION, TREATMENT AND USES *(Zinn. Berg- und hüttenmannische Gewinnung, Verarbeitung und Verwendung)*

C. L. Mantell

Translated into German and Revised by

W. Lidle

Wilhelm Knapp, Halle (Saale), 1937. Paper, 6¼ x 9¼ in., 323 pages. Price 18.75 RM.

In translating Mantell's well known monograph, published in 1929, Dr Lidle has revised and added some new material to nearly every chapter. This has markedly enhanced the value of the book as a whole. Production, distribution and consumption statistics have been brought up to 1933 and 1934 and many new tables and figures added to include German practice and products as well as recent information. A new section has been added on pretreatment of tin concentrates before smelting, particularly on roasting as applied to Bolivian concentrates. Application of the Walz kiln to the metallurgy of tin is well described and illustrated. A useful summary is given of the chief German patents covering leaching and reduction of tin ores, and refining of crude tin; also, a review has been added on American, English, and Japanese patents on the electrolytic refining of tin.

The discussion of bronze has been rewritten and 15 new tables inserted on effects of alloying elements on mechanical properties of tin. Tables have also been added on corrosion of bronze and a very favorable comparison made on the resistance to sea water corrosion of tin compared to that of many other metals and alloys. The section on white metals has also been greatly improved by many new tabulations.

The reworking of secondary tin into commercial tin products is particularly well treated and constitutes practically a new section. Of particular interest is the description of the treatment of scrap bronze by electrolytic refining or by converter refining followed by recovery of components from the mixed oxide fume. New notes have been added on detinning, as with caustic and litharge.

This German revision is well organized, includes much new material, and should prove desirable for anyone directly concerned with the metallurgy of tin bearing materials. Of particular importance are the many new tables and figures which can be readily understood even by those who cannot readily read the text.
B. W. GONSER.

METALLURGY OF LEAD AND ZINC 1936. *Trans.* A. I. M. E., Vol. 121, 1936

Amer. Inst. Mining and Met. Engrs., New York, 1936. Cloth, 6 x 9 in., 748 pages. Price $5.00.

Although the A.I.M.E. normally publishes only new material, in view of the lack of description elsewhere of improvements in existing practice several "state of the art" paper were included describing well known operations.

The volume includes 41 papers. Those on lead deal with sintering, blast furnace smelting, smelting on the ore hearth, equilibrium in smelting, drosses, softening bullion, removal of Bi and of Zn, refining in general, including electrolytic processes and the production of solder electrolytically. Bag house and Cottrell process methods for fume collection are described.

The section on zinc covers sintering, roasting, the N. J. Zinc Company retort processes, 5 papers on electrolytic zinc, descriptions of the Trollhättan and the St. Joseph Lead Company's electrothermic processes, papers on the old retort process, a description of the present status of and future hopes for natural gas reduction, and papers on production of zinc oxide, and treatment of residues and slags.

Historical papers trace the metallurgical and engineering developments from thei rvery crude beginnings. With this background and the amazing mass of engineering detail recorded in the other papers, the volume well deserves its title, though it is only the smelting or process metallurgy that is covered.

The preface apologizes for the absence of papers on treatment of secondary lead and zinc, and holds out hope that the Institute may, in later volumes, deal similarly with those subjects. It is to be hoped that papers dealing especially with cadmium can be added also. H. W. GILLETT.

THE RENAISSANCE OF PHYSICS

Karl K. Darrow

Macmillan Co., New York, 1937. Cloth, 6x8¾ in., 306 pages. Price $3.50.

This three hundred page book was sent to press ten years later than the same author's classic "Introduction to Contemporary Physics." Comparison of the two shows at once how sound was the foundation ten years ago and how rapid has been the intervening progress.

Metallurgists should welcome this book. No contemporary author makes the mysteries of the new physics so understandable to the non-physicist. It should not be merely read: it should be studied. Dry reading? No, it fascinates more than the detective thriller. It is the story of the ceaseless campaign to discover Nature's inorganic secrets, beginning with the interesting but puny electrical forces resulting from rubbing a piece of amber with a piece of cloth, and ending with the crowning achievement of modern physics—the transmutation of the elements.

Of especial interest to metallurgists are the clear definitions of the building-blocks of matter, old and new. The theoretical metallurgist, at least, has been struggling with molecules, atoms, protons, ions, electrons, and even isotopes and radio-activity, for many years. In the future he must give consideration also to neutrons, positrons and deuterons, the discoveries and properties of which are so interestingly described. The unique apparatus used in making some of these discoveries and in gaining additional qualitative and quantitative information is not only clearly described but is illustrated by drawings and photographs.

Although philosophical sidelights give the reader welcome greetings all through the pages, the final chapter—"Unity of Nature"—beautifully weaves the various separate threads into a single fabric which is wonderful to behold. Matter, electricity, radiant energy! Each is convertible into the other and the conversion mechanisms are reversible. "No element, nor matter itself, nor light itself, is permanent. All that is perpetual is something of which they are all made, incarnating itself in all of them by turn, and passing unimpaired from form to form. For this immortal substance the least inadequate name, I presume, is 'energy' . . . The belief that all things are made of a single substance is old as thought itself; but ours is the generation which, first of all in history, is able to receive the unity of Nature not as a baseless dogma or a hopeless aspiration, but a principle of science based on proof as sharp and clear as anything which is known."—ZAY JEFFRIES.

COLLECTED PORTFOLIO OF WORKS TECHNIQUE

(Betriebstechnische Sammelmappe)

V. D. I—Verlag, Berlin, 1937. Paper, 8½ x 12¼ in., 54 pages. Price 6 RM.

These are recommended practice sheets, collected from recent issues of *Maschinenbau*. Of interest to metallurgists are those on temperature measurement, cold cut-off sawing, hot forging, Ni steels, carbide tools, diamond tools, grinding, dressing of grinding wheels, machining and forming light alloys, deep drawing of stainless steel and of zinc, solders and soldering, arc and gas welding, torch cutting, salt baths, carburizing, hardening high speed steel, hardness conversion curves for cast iron and for steel, and chromium plating. The last ends with a warning to the workers not to eat, drink or smoke in the chromium plating room, and at recesses between working periods to drink milk instead of beer.

The information appears valid as far as it goes, but in this tabloid method of presentation space is lacking for really adequate treatment of most of the subject.—H. W. GILLETT.

TEXTBOOK OF PHYSICAL CHEMISTRY

(Lehrbuch der physikalischen Chemie)

Vol. 5, 2d section
K. Jellinek

Ferdinand Enke Verlag, Stuttgart, 1937. Paper, 6¼ x 9½ in., 412 pages. Price 41 RM., less 25% on foreign orders.

This volume completes this extensive treatise. It contains discussion of such matters as dipoles and dipole moments, magnetic properties of atoms and molecules, spectra, molecular structure, electron paths, crystallography, X-ray study of crystal structure, metallic structure, electron emission, radiation emission and absorption, and photochemistry.

The book is authoritative. With its discussion of the fundamentals of magnetism, crystal structure and radiation pyrometry this particular volume contains material of direct interest to metallurgists.—H. W. GILLETT.

ZERO TO EIGHTY

Akad Pseudoman
(E. F. Northrup)

Scientific Publishing Co., Princeton, 1937. Cloth, 6½x9¼ in., 283 pages. Price $3.00.

While this is not a metallurgical book, it will interest many metallurgists because of the close connection it has with one of their most useful tools, the high frequency induction furnace. Using similar principles, Dr. Northrup has speculated, and on a small scale, experimented with a projectile propelled by high frequency currents, and which combined with Goddard's rocket schemes and utilizing other well-established principles of physics makes it theoretically possible for humans to make a trip around the moon (though not to land upon it) and return safely to earth. The story is a fanciful one, written as of A. D. 2000 in the shape of an autobiography of the inventor of the space-ship, recording at 80 his life work in bringing the space-ship idea along from the first hunch through to the trip itself.

The principles of physics that are utilized are set forth in the appendix, while the narrative itself is not so very different from some of the types that appear in our esteemed contemporary, The *Argosy*, except that Dr. Northrup's assumptions in physics are far more credible. As a story, it would probably have been accepted by *Argosy*, that is, it has interest to those who like the fantastic. The phraseology is a bit stilted, but perhaps by 2000, authors will have reverted to the style of the 1890's; so we may set that down to local, or temporal, color.

In order to finance the experimental work, Pseudoman gets a large legacy and finds a gold mine; so he has a million to spend, plus a backer with several millions. We judge this indicates that Dr. Northrup does not believe the New Deal will have survived and have eliminated property rights, inheritance, millionaires, and gold values by 25 years from now.

Even though Dr. Northrup had not signed the preface and had made the book entirely anonymous, its authorship would not have been in doubt, since it is dedicated to Dr. Clamer and the pointers and the quail that Dr. Northrup loves so well appear right along, to say nothing of the use of high frequency.

We were interested to note that Dr. Northrup does not have his inventor-hero go to college, but rather to take a few special courses and then study and experiment for himself. Also that the School of Associative Science endowed by the hero in later life does not prepare specialists but concentrates on teaching the interrelation of all sciences, i.e., all truths based solely on evidence. Some of our highbrow physicists would be barred from teaching in this school for it omits "all instruction which deals with inconceivables." He says, "If the mind can form no mental picture of what mathematics states, then its worth in the advancement of scientific knowledge is nil."

The book is delightful "off-the-trail" reading, even though the *Argosy* fan may miss the blood-curdling episodes he is used to. —H. W. GILLETT.

ENGINEERING DATA — RESISTANCE WELDING, THEORY AND PRACTICE. HARD, HIGH-CONDUCTIVITY ALLOY APPLICATIONS

P. R. Mallory & Co., Indianapolis, Indiana, March 1937. Cloth, 8½ x 11 in., 96 pages. Price $2.00.

The characteristics of materials to be welded, such as Al, Cu, and their alloys M and Monel, stainless of various types and soft steel are discussed in relation to several resistance welding methods. The materials made by Mallory for use as resistance welding electrodes are described, as to mechanical properties, conductivity, stability at operating temperatures, and applicability for other uses. These materials are identified only by numbers and trade names, not by composition, though some general statements are made as to the use of W, Mo and their carbides along with Cu or Ag. The precipitation-hardening Cu alloys used are not identified.

The general discussion of resistance welding includes photos and some description of a variety of makes of welding equipment, with explanation of the way the welding is accomplished. Upsetting by pressure under electrical heat, and an elementary discussion of timing devices are included. Twelve pages of miscellaneous tables of the hand book type and 67 references to pertinent welding literature are given.

The book is of the combined hand book and catalog type, with sufficient of the former, and with so good a general picture of the principles and processes of resistance welding to make it a worthwhile addition to the metallurgist's book shelf—H. W. GILLETT.

Current News Items

New Producers of Rare Metals and Hydrides

A new corporation, Metal Hydrides Inc., with business address at Post Office Box 816, Clifton, Mass., has been granted a Massachusetts charter and will produce titanium, zirconium, thorium, uranium and alloys of copper-titanium, copper-zirconium and nickel-titanium as well as hydrides of titanium, zirconium, thorium and calcium.

Metal Hydrides, Inc. is a private corporation, subsidiary to Alloys Ltd., a Canadian company with Head Office at 25 King St. West, Toronto, Canada. The directors of Metal Hydrides Inc. are N. F. Parkinson, J. C. Rix and A. G. Fulton, all of Toronto. The president is N. F. Parkinson; the general manager is Dr. P. P. Alexander of 79 Rockaway Avenue, Clifton, Mass. The Treasurer is A. G. Fulton and the clerk of the company is Mrs. Peter Alexander of Clifton, Mass.

Production of these metals and metal products has already been proceeding for some time prior to the incorporation of Metal Hydrides Inc. The incorporation of the company marks a forward step in that the previous work has been experimental and for the purpose of developing the new Hydride Process, patented as a result of the work of Dr. Alexander.

American Rolling Mill Co.'s New Blast Furnace

The new million-dollar blast furnace being erected by The Hamilton Coke & Iron Co. near Hamilton, Ohio, will be ready for operation early in August, according to J. A. B. Lovett, vice-president and general manager of the company. Work on the furnace was started in December, 1936.

The Hamilton Coke & Iron Co. is a completely owned subsidiary of The American Rolling Mill Co., Middletown, Ohio. Located only 10 miles from one of Armco's chief plants, it is to supply molten pig iron to the open-hearth furnaces. A special train transports the liquid metal in huge "thermos bottle" tanks.

Completion of the new furnace will give the company a daily capacity of about 1200 tons of pig iron. The present furnace, which was completely rebuilt and modernized last year, has a capacity of more than 700 tons a day.

Addition of the second blast furnace is for the production of Buckeye foundry iron, as the product is known. The new furnace has a hearth 13½ ft. in diameter and is capable of producing more than 450 tons of merchant pig iron a day.

New Fine Steels Book By Ludlum

Bearing the title, "Fine Steels by Ludlum," Ludlum Steel Co., Watervliet, N. Y., has recently published an attractive, pocket size book containing a number of new charts, conversion tables and other useful facts. Included are a tool steel finder showing how to select the correct tool steel for a particular job; also a stainless finder accompanied by a table showing the comparative resistance of each grade of stainless to the various corrosive agents.

Other data, gathered by means of physical tests and practical experience, cover nitralloy and special products such as hollow drill steel, magnet steel, welding rods for hard surfacing, etc.

A. F. A. to Hold Regional Meetings in Fall

The American Foundrymen's Association, in cooperation with certain of its chapters and various universities, has scheduled three regional meetings and one mid-year technical meeting for the Fall season.

The first of the four meetings will be the mid-year technical sessions to be held at Columbus, Ohio, through the joint cooperation of the Battelle Memorial Institute and A.F.A. Sept. 30 and Oct. 1 are the dates decided upon for the meeting which will be devoted exclusively to a thorough discussion of a few outstanding technical problems relating to steel, non-ferrous and gray iron foundries. Conference leaders will be chosen from the foremost foundry technologists. Those attending will have the opportunity to inspect the Institute's new foundry research laboratory, a building given over entirely to the study of foundry metals and processes. Dr. C. H. Lorig and C. E. Sims, of the institute staff, are in charge of the program for the meeting. According to tentative plans Clyde Williams, director of the institute, will give the address of welcome and sessions will be held on non-ferrous alloys with Dr. H. W. Gillett as chairman and Dr. Bruce Gonser discussing the effects of chromium on copper alloys. The cast iron sessions will deal with structures of cast iron with a notable array of speakers. The steel castings session will discuss alloy steels and the effect of aluminum on cast steel.

The first regional conference of the year will be held at Missouri School of Mines, Rolla, Mo., under the joint auspices of A.F.A., St. Louis District Chapter of A.F.A. and the University. Dates set for the meeting are Oct. 8 and 9 and a tentative program, as drawn up by the St. Louis district chapter committee, includes sessions on sands, refractories, metallography, non-ferrous castings, gray and alloy irons. A dinner and luncheon are scheduled. H. Bornstein, Deere & Co., Moline, Ill., president-elect of A.F.A., is scheduled as the dinner speaker. A notable array of talent, both local and national, also has been secured for this meeting. Full details of the program will be given later.

Another regional meeting is proposed for Cornell University, Ithaca, N. Y., to be held under the joint auspices of A.F.A., the Buffalo Chapter and the University. This meeting probably will be held the latter part of November. At present, the university is working on a tentative program.

A second annual Iowa conference also will be held in conjunction with the Quad City Chapter and one of the state universities. As yet no date has been set and details will be available later.

● The Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, makers of rough and finished drop and hammer forgings, is adding a new building of 15,000 sq. ft. to house the added machine shop facilities. This building will be set apart from their hammer shop to allow for producing precision machine work, and will be completely tooled with modern high-speed machine tools for rough and finish machining of small and large forgings to 30 tons in weight. The company's expansion program includes the addition of new die sinking equipment, several new hammers, and additional heat treating furnaces. The entire plant is being converted for gas burning to increase heating speed and efficiency on all sizes of job forgings.

Hydrides and Metals

PRODUCTS OF THE HYDRIDE PROCESS

METALLIC hydrides are dissociated on heating above 300°C and give off large volumes of nascent hydrogen.

They are recommended as the source of a supply of 100% pure hydrogen.

Metallic hydrides offer new possibilities in the production of alloys due to the liberation and protective effect of nascent hydrogen during the alloying process.

Metallic hydrides are safer to handle than fine powdered metals in degassed state.

The hydrides on degassing supply pure metals either in the form of very fine powders or sintered ingots.

If you are interested in nascent hydrogen or new alloys which can be made by this process, write us for detailed information and advice.

PRODUCTS	AVAILABLE FORMS
Titanium Hydride	Powder 200-300 mesh
Zirconium Hydride	Powder 200-300 mesh
Thorium Hydride	Powder 200-300 mesh
Calcium Hydride	Lumps or Powder
Titanium Metal	Powder 200-300 mesh
Zirconium Metal	Powder 200-300 mesh
Thorium Metal	Powder 200-300 mesh
Uranium Metal	Powder 200-300 mesh
Copper-Titanium Alloys	
1) Ti—30%	Ingots
2) Ti—60%	Powder 200-200 mesh
Copper-Zirconium Alloy Zr 13%	Ingots
Nickel-Titanium Alloys Ti 20 to 60%	Ingots

Patents issued and pending in the U.S.A. and Foreign Countries

HYDRIDES AND METALS

METAL HYDRIDES INC.

BOX 816, CLIFTON, MASSACHUSETTS

Silver Medals to Old Employees of Steel Corp.

Silver medals awarded in recognition of 25 yrs. of service with the U. S. Steel Corp. were presented to 255 employees of South Works of the Carnegie-Illinois Steel Corp. on Sunday morning, July 18, at the Commercial Theatre, 9150 Commercial Ave. Guests at the presentation program included retired employees and their wives, medal recipients and their wives, clergymen, south side business leaders and representatives of South Chicago civic organizations.

E. E. Moore, general superintendent of South Works, presided at the ceremonies. Immediately following presentation, a motion picture story of the manufacture of steel was shown. The South Works male chorus and the newly organized South Works orchestra presented a musical program.

Union Sells Carbide Die Business to Carboloy Co.

Effective July 15, 1937, The Union Wire Die Corp., engaged in the manufacture and sale of Widia cemented carbide drawing and extrusion dies, has sold, to Carboloy Co., Inc., Detroit, its entire assets and interests in the cemented carbide business.

The new organization will combine the entire research, manufacturing, sales and service facilities of these two largest cemented carbide suppliers in the United States. Both "Unwidies" (Widia cemented carbide dies) and Carboloy cemented carbide dies will continue to be supplied as in the past and through the same channels of sales and service.

Metals at the New York World's Fair of 1939

Metals and metal products will be on parade at the New York World's Fair of 1939 in a new line-up and in more brilliant array than ever before. Such, at any rate, is the expectation at the Fair Corporation offices, to which both American and foreign industry are reported already marching with requests or proposals relative to ground allotment and display space.

The prominence of metals in the vast exhibit areas provided is expected, indeed, to be proportionate to the role these prime necessities play in present-day conveniences and delights and to their importance in the future. This is virtually inevitable, since the New York exposition is being erected about the theme "Building the World of Tomorrow," which might be the metal industry's own slogan. That theme gives to the $125,000,000 exposition a widely-acclaimed "spiritual quality," setting it aside as "quite different" and more significant than any predecessor or contemporary fair. And the Fair Corporation's construction activities or display plans are quite in keeping with its theme.

At a time when building construction is just getting under way at the 1216½-acre site, a few minutes ride from midtown Manhattan, and when a string of final building designs is just coming from the draughting tables, the Fair officials announce that both ground areas and building space have been designated for metals and metal products display. Metals, according to the announcements, will be accorded exhibit in the outstanding Hall of Production whose published designs have already been referred to as "both spectacular and handsome." This structure not only occupies a prominent location in the Means of Production Zone, one of the largest of all the exposition's schematic zones, but it occupies a location second in prominence only to the Perisphere and Trylon, those unique structures designed to house the Fair's master exhibit of the Theme Centre itself.

● Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind., has announced plans for the construction of a new building at its plant in Kokomo to provide room for the company's growing business. Plans call for a new two-story fireproof office building, 132 ft. long and 44 ft. wide. The office building exterior will be of brick and stone construction, and its entrance and interior are to be decorated with stainless steel and marble. This new structure is the first of several contemplated under an expansion program. Plans also provide for remodeling the present office building into a recreation center.

Personals

● William Printz, 45 West 34th St., New York City, has been appointed sales manager for the Eastern Division of the Wheelco Instruments Co. of Chicago, manufacturers of temperature indicating and control instruments of all kinds. He will be in charge of all sales along the Eastern Seaboard. For the past 20 yrs. Mr. Printz has been associated in the temperature control instrument field, having served in both the manufacturing and sales divisions of several well known instrument manufacturers.

● H. B. Allen, who for 14 yrs. was New York district sales manager of The Babcock & Wilcox Tube Co., has resigned from that company to become vice-president of John B. Astell & Co., Inc., 90 West Broadway, New York, distributor in the New York Metropolitan district of B & W seamless carbon steel boiler tubes and alloy tubes, and a wide variety of other tubular products including all kinds of welding fittings.

● Dr. C. L. Mantell announces the removal of his consulting engineering activities from Pratt Institute to 360 Furman St., Brooklyn.

● Carboloy Co. Inc., Detroit, manufacturers of Carboloy cemented carbide tools, dies, and wheel dressers recently announced the following changes in, and additions to, the personnel of their organization. F. C. Ritner has been appointed assistant to the president, in charge of special wear resistant applications, new developments, and special products. T. D. MacLafferty, formerly of the Detroit district office of the General Electric Co., has been appointed to the general sales offices as assistant to Mr. Beardslee, general sales manager. H. C. Stone, formerly of the Newark Office, will represent the Carboloy Co. in Brooklyn and New York City territory.

● G. W. Hoskins, recently with Lincoln Electric Co., has joined the Harnischfeger Corp. of Milwaukee as sales engineer for smootharc welder and weld rods in the P & H Philadelphia territory.

● D. A. Williams, president of the Continental Steel Corp., announces the appointment of Ralph K. Clifford, formerly general superintendent, as works manager of Continental's Kokomo plant. Julian L. Schueler, formerly superintendent of the steel and wire division, has been named general superintendent.

● Their many friends and acquaintances among the metal working industries will be interested to know that Francis Leslie and U. V. Westover have recently been appointed sales engineers in the New York territory for P & H smootharc welders and weld rods, manufactured by the Harnischfeger Corp. of Milwaukee.

● Appointment of H. F. Boe as commercial manager of the Westinghouse Electric & Mfg. Co., is announced by N. G. Symonds, vice president. Mr. Boe will have two headquarters, one in the Union Bank Building at Pittsburgh, the other at 150 Broadway, New York. In addition to being responsible for the sale of Westinghouse products in the Eastern District, Mr. Boe will now direct the commercial activities of the apparatus divisions.

● At a recent meeting of the board of directors of Joseph T. Ryerson & Son, Inc., Everett D. Graff, first vice president, was elected president. Mr. Graff has been with the Ryerson company for 31 yrs., having come with the company immediately upon graduation from college in 1906. Edward L. Ryerson, Jr., is chairman of the board of the Ryerson company and vice chairman of the Inland Steel Co.

● Fred Hurst, representative of Roxalin Flexible Lacquer Co., Inc., of Elizabeth, N. J., has been stationed in the Chicago area. He is located at 5855 North Mobile Ave., Chicago. Mr. Hurst is a practical finishing man, with a background of 16 yrs. as supervisor in the finishing departments of the Waterbury Mfg. Co. and Volupte. Mr. Hurst moved to Chicago after a year of training in the Roxalin laboratory. Howard Verrault is now representing Roxalin Flexible Lacquer Co., Inc., in the upstate New York territory, making his headquarters in Rochester, N. Y. Mr. Verrault has gone through a year of intensive training in the Roxalin laboratory.

STANDARD NICKEL CHROME ALLOY CASTINGS

YOU have a set of standards by which you judge the results you buy from us. You judge the quality of our product. You judge our service.

We must have a set of standards if we are to meet yours. *Our* standards must answer for the quality of raw materials, correctness of analysis, intelligent foundry practice, soundness of research—for facilities in general.

Standard Alloy nickel chrome alloy castings must be *standard* in more than name. They—and we—must satisfy the standards *you* set for quality and service.

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STANDARD ALLOY COMPANY, Inc.
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STANDARD *Heat-Resisting* CASTINGS
NICKEL CHROME ALLOY

Manufacturers' Literature

High Temperature Cement

The applications and engineering properties of Sonittep high temperature cement, claimed to prolong refractory life 15 to 30%, are given in this folder. George F. Pettinos, Inc., Philadelphia, Pa. (B 1081)

Non-Ferrous Ingots

Ajax 7 point ingots have 7 outstanding advantages, according to this bulletin, which gives the A. S. T. M. specifications and examples of uses of bronzes, brasses and high lead alloys. Ajax Metal Co., Philadelphia, Pa. (B 1082)

Economical Cleaning of Castings

Whiting roller-bearing tumbling mills provide quick, low-cost dust-free cleaning of castings, according to catalog No. 217, which also gives detailed description of equipment and drives. Whiting Corporation, Harvey, Ill. (B 1083)

Reducing Oxidation and Decarburization in Heat Treating

R-S Furnace Pressure Control for oil and gas-fired heat treating operations improves uniformity by effecting even thermal distribution, balanced combustion and a minimum of surface alteration. R-S Products Corporation, Philadelphia, Pa. (B 1084)

Comparison Microscope

With the Busch comparison microscope the observer sees through a single eyepiece the magnified images of specimen and standard side by side without any separation. George Scherr Co., Inc., New York. (B 1085)

Checker Brick

Technical data and uses of Superior open hearth checker brick, which is claimed to produce a solid stable checker volume, absolutely straight flues and fuel economy through interlocking construction, are given. William M. Bailey Co., Pittsburgh, Pa. (B 1086)

Hot Galvanizing

"A Guide to Longer Life for Iron and Steel Products" is the title of this interesting pamphlet giving the history, applications and advantages of hot galvanizing. American Hot Dip Galvanizers Assoc. Inc., Pittsburgh, Pa. (B 1087)

Muffle Furnaces

Bulletin HD 537 describes Hevi Duty Laboratory Muffle Furnace HD-92 (with transformer and rheostat) claimed to be more ruggedly constructed for longer operation at higher temperatures. Hevi Duty Electric Co., Milwaukee, Wis. (B 1088)

Temperature and Pressure Instruments

This new 56 page catalog (No. 1060C) gives complete structural, installation and operating data for TAG indicating and recording temperature and pressure instruments. C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. (B 1089)

Silicate Cements for Acid Resistance

Reprints of a paper by F. D. Snell and H. Farkas on "Quick-setting Silicate of Soda Cements for Acid-proof Tank and Tower Construction" are offered by U. S. Stoneware Co., Akron, Ohio. (B 1090)

Charger for Small Cupolas

The Tiger Skip-Hoist Cupola charger, claimed to make possible low cost hot metal from small cupolas with better control and easier operation, is described in folder of the Whiting Corporation. Harvey, Ill. (B 1091)

Hard Facing Welding Rods

Bulletin No. 20 on "Amsco Hard Facing Welding Rods" illustrates a number of important applications and many suggestions for correct use. American Manganese Steel Co., Chicago Heights, Ill. (B 1092)

Microscopes and Auxiliary Equipment

Toolmakers' wide field binocular, junior binocular, and shop microscopes, together with Brinell and tube microscopes and optical aids are described and illustrated in catalog D-22 of Bausch & Lomb Optical Co., Rochester, N. Y. (B 1093)

Metallurgical Testing Equipment

Louis Schopper metal testing machines and appliances for measuring tensile, compression or torsional strength, elongation, hardness, impact resistance, etc., are described in catalog 390. Testing Machines, Inc., New York, N. Y. (B 1094)

Ampco Metal

Engineering data sheet No. 42 offers further data concerning Rockwell and Brinell measuring, supplementing those in data sheet No. 41. Ampco Metal, Inc., Milwaukee, Wis. (B 1095)

Measuring the Flow of Air and Gases

Flow meters for measuring the flow of air and gases of all kinds to obtain control of gas burning operations and carburizing are featured in a leaflet which contains a description and diagrams of these instruments. American Gas Furnace Co., Elizabeth, N. J. (B 1096)

Modern Annealing Practice

Photographs and blueprints illustrate six different forms of radiant tube annealing covers for sheet, strip, rod and wire. A brief description for manufacturing the prepared atmosphere used with these annealing covers is included. Surface Combustion Corp., Toledo, O. (B 1097)

Wear Tester

The Taber Abraser for measuring the wear resistance, adhesion and rub-off qualities of finishes is the subject of a well-illustrated booklet. Taber Instrument Co., North Tonawanda, N. Y. (B 1098)

Blue Book of Thermometals

Complete mechanical, thermal and electrical characteristics for all standard types of Wilco thermometals are included in this book which contains a review of properties and applications of modern thermostatic bimetals. H. A. Wilson Co., Newark, N. J. (B 1099)

Purifying Molten Iron

An iron finishing compound used in the pouring ladle for improving the castings is described in a pamphlet of The Maluminum Co., Indianapolis, Ind. (B 1100)

Die Casting Equipment and Alloys

A bulletin covering lubricators, die castings and dies, designs and casting machines and Kipp Air Tools, describes as a complete die casting service the products of the Madison-Kipp Corp., Madison, Wis. (B 1101)

Refractory

Thermal Alumina which can be used for working temperatures up to 1950 deg. C. and is suitable for the fusion of metals, alloys and alkalies while having a slow rate of reaction with concentrated alkaline solutions, fused salts or boiling concentrated sulphuric acid, according to the manufacturer, is the subject of an illustrated leaflet of The Thermal Syndicate, Ltd., Brooklyn, N. Y. (B 1102)

Testing Machines

The Southwark-Emery line of testing equipment is featured in a fully illustrated bulletin, containing charts, curves and technical data. Baldwin-Southwark Corp., Philadelphia, Pa. (B 1103)

Automatic Optical Pyrometer

Bulletin No. 91-1 is devoted to the Optimatic sighting tube, the power supply unit and the instruments which comprise the Optimatic System for measuring surface temperatures of hot bodies in motion or at rest. The Brown Instrument Co., Philadelphia, Pa. (B 1104)

Buffs and Compositions

Bulletin No. BC-104 contains pictures of the various types of buffs and compositions as well as a description of their uses. Hanson-Van Winkle-Munning Co., Matawan, N. J. (B 1105)

Ground Shafting

Turned, ground and polished shafting and small diameter drawn, ground and polished bars are discussed in a leaflet illustrating the modern production methods used in manufacturing them. Bliss & Laughlin, Inc., Harvey, Ill. (B 1106)

Retorts for Gas Carburizing

Rotary and stationary retorts are discussed in a leaflet which gives different analyses which may be used for varying conditions. The Calorizing Co., Pittsburgh, Pa. (B 1107)

Spring Making

A handbook of modern spring engineering for users and designers of springs, containing useful data as well as illustrations, diagrams and engineering tables, has been issued by Barnes-Gibson-Raymond, Detroit, Mich. (B 1108)

MANUFACTURERS' LITERATURE

Air Drawing

It is claimed that this company's air drawing furnaces produce uniform Brinell hardness and grain structure. Diagrams and description. General Combustion Corp., Chicago, Ill. (B 1109)

Testing Machine

This machine, for tensile, transverse and compression testing (capacity 30,000 lbs.) is the subject of a leaflet of the Detroit Testing Machine Co., Detroit, Mich. (B 1110)

Adachrome

This plastic chrome cement, claimed to hold its component materials in suspension indefinitely, is described in a pamphlet. Botfield Refractories Co., Philadelphia, Pa. (B 1111)

Hy-Speed Case

It is claimed that this case has a sufficiently low melting point so that it can be used from 900 to 1100° F. on high speed tools. A. F. Holden Co., New Haven, Conn. (B 1112)

Steel in Forged Sections

Hardness conversion tables and tensile property tables are included in this catalog which also gives specific effects of alloying elements in steel. Heppenstall Co., Pittsburgh, Pa. (B 1113)

Corrosion and Heat-Resisting Steels

Enduro Types HCN, NC-3 and HC are described in a leaflet containing analyses, physical properties, instructions for working and applications. Republic Steel Corp., Massillon, O. (B 1114)

Insulating Brick

Physical properties of the new JM-20 insulating brick, designed for use behind refractory walls in furnaces are given in a leaflet featuring a table of heat losses transmitted through fire brick walls bare and insulated with JM-20 brick. Johns-Manville, New York, N. Y. (B 1115)

Zinc Alloy Die Castings

This supplement of "A Visual Report of Progress" brings the progress being made in the die casting industry up to date. The New Jersey Zinc Co., New York, N. Y. (B 1116)

Thermalloy Castings

Information on Ni-Cr castings for heat and corrosion resistance which are X-ray inspected is given in a bulletin of the Electro Alloys Co., Elyria, O. (B 1117)

Carbide Tools and Blanks

Catalog M-37 gives complete data on sizes and prices of Carboloy blanks, and specifications and prices of Carboloy standard completely-ground and unground tools. Carboloy Co., Inc., Detroit, Mich. (B 1118)

Handling Heat

Alundum and Crystolon refractories for furnace and kiln linings and parts resist spalling, warpage, deformation under load and are of uniform dimensions according to publication No. 5 of the Norton Company, Worcester, Mass. (B 1119)

Dehumidifiers

Lectrodryer systems, employing Activated Alumina for drying air and other gases by adsorption, are described in this well illustrated booklet by the Pittsburgh Lectrodryer Corp., Pittsburgh, Pa. (B 1120)

Metallographic Polishing Machines

Direct drive (no belt or friction drive) polishing machines are described as providing operating smoothness, sturdiness and flexibility in this bulletin of the Cincinnati Electrical Tool Co., Cincinnati, Ohio. (B 1121)

Heat Treating Furnaces

Electric and fuel fired furnaces for annealing, forging, hardening and die casting, and burner accessories are illustrated in Bulletin No. 39. W. S. Rockwell Co., New York. (B 1122)

Corrosion Resisting Equipment

New catalog of equipment made exclusively to handle corrosive solutions gives complete data, including sizes, capacities and engineering information, on materials, parts, containers, etc. Duriron Company, Inc., Dayton, Ohio. (B 1123)

Non-Ferrous Alloy Data Sheet

Exhaustive compilation of composition and mechanical and physical properties of 43 Revere bronze, brass and copper-nickel alloys, in tabular form. Revere Copper and Brass, Inc., New York. (B 1124)

Ladle Pouring Brick

Ironton ladle pouring bricks for hand, bull and crane ladles are claimed to reduce losses caused by slag entering the molds. Ironton Fire Brick Co., Ironton, Ohio. (B 1125)

Furnace Insulation

Thermal Vermiculite insulating products for temperatures up to 2200 deg. F. are described in a leaflet issued by Thermal Products Corporation, Pittsburgh, Pa. (B 1126)

Furnaces and Foundry Accessories

Bulletin No. 54 pictures various Fisher Crucible Melting Furnaces, as well as a variety of essential foundry accessories. Fisher Furnace Co., Chicago, Ill. (B 1127)

New Portable Pyrometer

Details of construction and operation of the Pyramid Pyrometer, which features quick calibration, flexible arm, and pistol type grip with conveniently visible dial, are given in this leaflet. Tamms Silica Co., Chicago, Ill. (B 1128)

Precision Valve for Furnaces

The improved Mehler precision valve, claimed to afford extremely fine regulation of fuel flow, is introduced to the general furnace field. Operating data are given. Mehler, Inc., Pittsburgh, Pa. (B 1129)

Controlled Reversal of Heating Operations

Type 2700 Timers automatically function any desired group of signals, valves and dampers to accomplish the actual reversal of the furnace. Automatic Temperature Control Co., Philadelphia, Pa. (B 1130)

Control System

Bulletin No. 460T describes a coordinated control system for industrial processes. The Bristol Co., Waterbury, Conn. (B 1131)

Double Chamber Melting Furnace

Monarch-Rockwell furnaces, with double heat-exchanging chamber construction fired with gas or oil, are described and illustrated. Monarch Engrg. and Mfg. Co., Baltimore, Md. (B 1132)

Hammer Boards

The features of Durock and Silverock hammer boards, claimed to provide higher resistance to warping, longer service at lower cost, and faster hammer operation, are discussed. Irwin Lumber Co., Erie, Pa. (B 1133)

Magnetic Separation in the Foundry

Interesting applications of the Dings high intensity separator for magnetic removal of metals from sand, abrasive grains, etc., are described. Dings Magnetic Separator Co., Milwaukee, Wis. (B 1134)

Resistance to Abrasion

A practically diamond-hard surface in an alloy that can be bonded is offered by Xaloy, which can be applied to the surface of any steel, according to a leaflet issued by Wilcox-Rich, Detroit, Mich. (B 1135)

Industrial Ovens

Catalog No. 14 is a collection of bulletins dealing with the various types of ovens manufactured by the Despatch Oven Co., Minneapolis, Minn. (B 1136)

Ramming Mix

Instructions for installation are included in a folder claiming that P. B. Sillimanite ramming mix can be used under the most severe operating conditions. Chas. Taylor Sons Co., Cincinnati, O. (B 1137)

Simplified Optical Pyrometer

Catalog No. 70 states that the PYRO optical pyrometer is a rugged instrument, simple in operation and suitable for the requirements of scientific laboratories as well as for heavy duty shop practice. The Pyrometer Instrument Co., New York, N. Y. (B 1138)

Special Atmospheres for Industrial Furnaces

An instructive booklet explaining in detail the methods and composition required in designing and manufacturing inert gases. Continental Industrial Engineers, Inc., Chicago, Ill. (B 1139)

Graphitic Steel

This steel which, it is claimed, combines the more desirable features of cast iron with the high strength of steel, is the subject of a pamphlet of the Timken Steel and Tube Co., Canton, O. (B 1140)

Career in Arc Welding

Bulletin No. 416 tells of the practical and technical instruction given by the Lincoln Welding School. The Lincoln Electric Co., Cleveland, O. (B 1141)

MANUFACTURERS' LITERATURE

Hold-Heet Pyrometers

Wall type and Lance type are described and illustrated in Bulletin No. 202. Russell Electric Co., Chicago, Ill. (B 1142)

Pyrometer Potentiometer

An improved potentiometer, unaffected by vibration is featured in a leaflet of The Lewis Engineering Co., Naugatuck, Conn. (B 1143)

Furnace Atmospheres

The reprint of a paper by A. J. Fisher which presents data for use in solving furnace atmosphere problems from an engineering approach, is offered by the C. M. Kemp Mfg. Co., Baltimore, Md. (B 1144)

Electric Heating Units and Devices

Numerous small heating units for a multitude of tasks are listed in Bulletin GED-650 of the General Electric Co., Schenectady, N. Y. (B 1145)

Air Weight Control

The importance of air weight control, and the advantages of this company's controller, are given in a leaflet of The Foxboro Co., Foxboro, Mass. (B 1146)

Single-Stage Motorblowers

An illustrated catalog devoted to Type FS Motorblower lists many of the applications for which it is fitted. Ingersoll-Rand, New York, N. Y. (B 1147)

Adjustable Orifice and Proportioning Valves

Leaflet describing and illustrating the above is offered by The North American Mfg. Co., Cleveland, O. (B 1148)

Brunorized Rails

The Brunorizing process for making better rails is described in an illustrated booklet. U. S. Steel Corp. Subsidiaries, Pittsburgh, Pa. (B 1149)

Plastic Refractory Lagging

Insulag, which may be applied on hot or cold surfaces of flues, ducts, etc., as well as on refractory brick and concrete and as a finishing coat for other insulation, is for use up to 2200 deg. F. Quigley Co., Inc., New York, N. Y. (B 1150)

Metal Melting Furnaces

Catalog No. 29 is devoted to the above furnaces, made interchangeable for gas or oil fuel. The Campbell-Hausfeld Co., Harrison, O. (B 1151)

Tantalum

Uses, physical properties and tables of working data on the above metal are given in a booklet of the Fansteel Metallurgical Corp., North Chicago, Ill. (B 1152)

Melting Furnace

The Walker furnace is identical with the cupola except that the metal is melted in a crucible, with decided advantages, according to this leaflet. Crucible Furnace Co., Inc., Charlottesville, Va. (B 1153)

Sand Conditioning

The claimed advantages and mechanism of the Speedmullor, which uses centrifugal force to mull more sand in less time with lower power cost, are described in an illustrated leaflet of the Beardsley & Piper Co., Chicago, Ill. (B 1154)

Wire Tester

Illustrated leaflet describes an improved type of machine for testing wire. Capacities are 0 to 250 lbs. and 0 to 500 lbs. Henry L. Scott Co., Providence, R. I. (B 1155)

Radiant Tube Heating Elements

The horizontal gas-fired radiant tube heating element is the subject of a leaflet of the Surface Combustion Corp., Toledo, O. (B 1156)

Phosphor Bronze Bearings

General purpose bearings of many types and compositions described in a bulletin with tables of progressive size listing. Johnson Bronze Co., New Castle, Pa. (B 1157)

Nickel Silver

Booklet describing this product as manufactured in sheets, strip, wire and rods, and profusely illustrated with the industrial applications of the product. The Riverside Metal Co., Burlington County, Riverside, N. J. (B 1158)

Magnet Steel

"Nipermag"—a permanent magnet alloy—is the subject of an illustrated booklet. Cinaudagraph Corp., Stamford, Conn. (B 1159)

Zinc Plating

Zin-O-Lyte, a process for bright zinc plating producing brilliant deposits direct from the bath without bright dipping, is the subject of a new bulletin of the Grasselli Chemicals Dept. of E. I. du Pont de Nemours & Co., Cleveland, O. (B 1160)

Flame Hardening

New method of surface hardening which heats the metal with oxyacetylene flame almost simultaneously quenching it with water is described by the Air Reduction Sales Co., New York, N. Y. (B 1161)

What Scientists Say of Leitz Ultropak

Bulletin No. 17 describes the personal experiences and applications to which Ultropak has been placed by scientific workers in various fields. E. Leitz, Inc., New York, N. Y. (B 1162)

Gasifier

A pamphlet on the Stewart gasifier claims that its use reduces fuel costs as much as 75%, produces a true gas of high B.t.u. value and is easier on furnace lining. Chicago Flexible Shaft Co., Chicago, Ill. (B 1163)

Positive Displacement Blowers

Bulletin 22-B12 discusses the structural features of these blowers. Roots-Connersville Blower Corp., Connersville, Ind. (B 1164)

Industrial Air Cleaning

Bulletin No. 904 discusses the use of electrostatic precipitators for air cleaning. The Pangborn Corp., Hagerstown, Md. (B 1165)

Surface Hardening by Induction

The TOCCO Process is discussed in an illustrated leaflet of The Ohio Crankshaft Co., Cleveland, O. (B 1166)

Chapmanizing

A pamphlet devoted to Chapmanizing compares it to nitriding and carburizing. The Chapman Valve Mfg. Co., Indian Orchard, Mass. (B 1167)

Electric Furnaces

Catalog No. 23 devoted to the Ajax Wyatt electric furnaces, claims highest possible thermal efficiency and automatic circulation of metal bath among their advantages. Ajax Electric Furnace Corp., Philadelphia, Pa. (B 1168)

Braze-Rite Furnace

This furnace, developed principally for brazing sintered carbide cutting tools, provides for localized heat to be applied only to the portion of the tool to be brazed. Firth-Sterling Steel Co., McKeesport, Pa. (B 1169)

Rapid Moore Lectromelt Furnaces

Bulletin No. TC describes patented lift and swing-aside-roof type quick top-charge electric melting and refining furnaces. Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa. (B 1170)

Molybdenum in Steel

Data on different types of molybdenum steels are given in an illustrated booklet of the Climax Molybdenum Co., New York, N. Y. (B 1171)

Ajax-Northrup Electric Furnaces

Bulletin No. 11, superseding Bulletin No. 6, is devoted to the large coreless induction furnaces of the Ajax Electrothermic Corp., Trenton, N. J. (B 1172)

Aluminum

An attractive booklet "Aluminum in Shopfitting and Display" contains a section devoted to practical points on use and fabrication. Arthur Seligman & Co., Inc., New York, N. Y. (B 1173)

Testing Machines

Catalog 50, Part L, features Olsen Universal testing machines. Complete descriptions and illustrations. Tinius Olsen Testing Machine Co., Philadelphia, Pa. (B 1174)

Nitralloy and Nitricastiron

Leaflet describing three groups of Nitralloy also discusses "Nitrard" and "Nitricastiron." The Nitralloy Corp., New York, N. Y. (B 1175)

Wellman Magazine

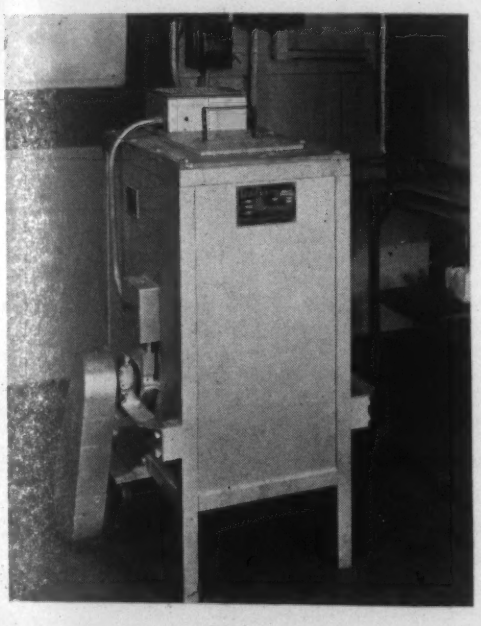
Items of interest and humor are contained in this monthly paper published by The Wellman Bronze and Aluminum Co., Cleveland, O. (B 1176)

New Equipment and Materials

Manufacturers are invited to send to the Editor items which are suitable for this department. Illustrations are acceptable, preferably in the form of cuts no more than 2 in. wide.

Lindberg Laboratory Cyclone Furnace

A new development by the Lindberg Engineering Co., Chicago, will be of interest to metallurgists all over the country. It consists of a small inexpensive laboratory furnace built on the same principle as the production type Cyclone furnace. Metallurgical laboratories, as a rule, have been using standard laboratory high temperature muffle furnaces for low temperature heating in spite of the fact that progressive companies today would not allow drawing to be done in such furnaces in the production shop. One reason for this has been that no equipment has been available for this class of work, although some laboratories have been using the smallest size production units which are expensive in original cost and generally much too large for laboratory work.



The "Lindberg Laboratory Cyclone Furnace" has a work chamber 8 in. in diameter by 10 in. deep, and is provided with a plug type cover which is easily lifted off for inserting the load. The electric heating elements are mounted in a separate chamber thereby eliminating all direct radiation to the charge. A powerful blower fan circulates the heated air through the work chamber, insuring rapid, uniform heating. The furnace is sturdily constructed of heavy steel plates, reinforced with structural angles which extend to the floor, forming the base and supporting the furnace at convenient working height. Efficient slab insulation keeps heat loss at a minimum throughout the temperature range up to 1250 deg. F.

This laboratory cyclone serves as an accurate and inexpensive pilot furnace for checking up on production, or for predetermining the response to specified heat treatments as well as for tempering small tools and individual steel parts.

Electrode For Flat Welding of Deep-Groove Joints

A new arc welding electrode, which has been developed especially for flat welding of deep-groove joints in mild steel and which provides welds of new high quality in this type of work, is announced by The Lincoln Electric Co., Cleveland.

The new electrode, known as "Fleetweld 9", will be welcomed by industrial concerns engaged in the manufacture of products such as tanks, pressure vessels, etc., utilizing heavy plate construction and requiring production of highest quality butt welds at maximum economy. The electrode provides weld deposits possessing high physical properties. Proper procedure with the electrode overcomes certain conditions frequently encountered in deep-groove welding which tend to cause the formation of surface holes in the metal. At the same time, the electrode has operating characteristics which assure uniformly economical performance.

All weld metal specimens of Fleetweld 9 will have tensile properties as follows, varying somewhat with the composition of the plate, the heat of welding, capacity of the plate and the size of the electrode used. The metal, as welded: Tensile strngth 66,000 to 74,000 lbs. per sq. in.; yield point 50,000 to 60,000 lbs. per sq. in.; ductility, elongation in 2 in., 20 to 30 per cent. Stress relieved at 1200 deg. F., Fleetweld 9 weld metal properties are: Tensile strength 64,000 to 72,000 lbs. per sq. in.; yield point 45,000 to 55,000 lbs. per sq. in.; and ductility elongation in 2 in. 25 to 40 per cent. Average tensile properties of stress relieved Fleetweld 9 weld metal, taken from 1½-in. plate welded with ¼ in. using 340 amps., A.C. are: Tensile strength 68,000 lbs. per sq. in.; yield point 53,000 lb. per sq. in.; ductility elongation in 2 in. 33 per cent. On free bend test a specimen of the metal showed 78 per cent elongation in outer fibers. Other phyiscal properties of Fleetweld 9 weld metal are: Specific gravity 7.85 to 7.86 grams per c.c.; impact resistance 30 to 60 ft. lbs. (Izod) and endurance limit 29,000 to 34,000 lbs. per sq. in.

Fleetweld 9 is designed to operate with either alternating or direct current. The electrode is made in three sizes, 3/16, ¼ and 5/16 in.

Carboloy-Tipped Centers

Carboloy Co., Inc., Detroit, manufacturers of cemented carbide tools, dies, and wheel dressers, announces a special application of Carboloy on lathe and grinder centers. These centers are the same as regular steel centers except that a Carboloy cone-shaped tip is substituted for the ordinary steel tips.

Reports to date by users show that these centers wear 50 times longer than ordinary centers. A recent test shows this wear resistant quality of Carboloy: Using No. 72 steel shot at 100 lbs. pressure, a bar of Carboloy ⅛ in. sq. was blasted for 40 mins. At the end of this period it showed no appreciable wear although its surface finish was slightly dulled. As compared to this, a bar of steel of the same size, and having a hardness of 65 Rockwell "C", was blasted for the same period. At the end of 40 mins., 50 per cent of its area at the point of blast had worn away. This is an excellent indication of the extreme wear-resistant qualities of Carboloy cemented carbide.

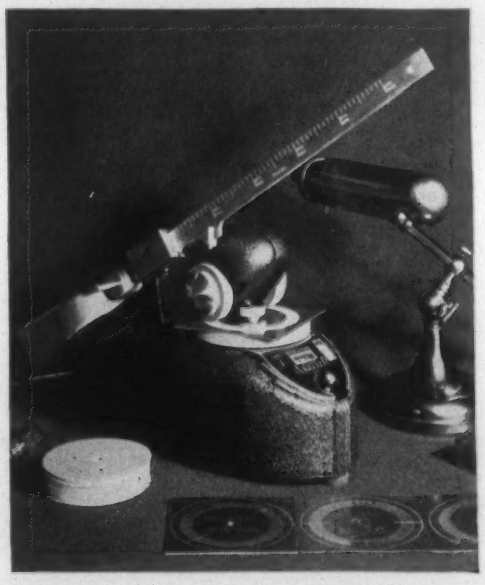
Besides its longer life, users report greater accuracy, elimination of burning and scoring, and fewer reconditionings. The centers are available in all sizes, finished complete, ready for use.

Machine for Measuring Wear Resistance

The Taber Instrument Co., North Tonawanda, N. Y., announces the "Taber Abraser," a precision testing machine for measuring the wear resistance, toughness, adhesion and rub-off qualities of surface finishes such as enamels, electroplate, anodizing, linoleum, moulded plastic sheets, and leather coverings.

In the research laboratory, the Taber Abraser is considered indispensible for testing new formulas, control work, checking competitive samples, grading, etc. Its lightness and portability make it possible for traveling sales technicians to prove their claims and to check competitive materials on location.

Concerns manufacturing products that require a tough, wear resisting finish are finding the Taber Abraser renders important service in



determining the type of enamel, number of coats, or thickness of finish necessary to meet use requirements.

In general, the Taber Abraser is adaptable for testing practically every type of enamel, lacquer, or other non-tacky coatings, including electroplated and anodic finishes. Tests to determine the comparative cutting efficiency of abrasive paper and cloth can also be made.

A Stainless Steel Soldering Flux

The Ruby Chemical Co., 68-70 McDowell St., Columbus, Ohio, manufacturers of Rubyfluid Soldering Flux, Soldering Paste and Core Solder, has announced a new stainless steel soldering flux that is quite revolutionary in its results and action on the metal.

When stainless steel was first introduced, manufacturers found it very difficult to solder. Sensing the need for a suitable flux that would give favorable action on the metal, and after several years of exhaustive laboratory tests and actual use in industrial plants, the company has perfected a flux that is more than satisfactory. The most outstanding features of this new stainless steel soldering flux are that no special soldering equipment or solder is needed and that it does not give off strong, offensive odors nor will it severely burn when in contact with hands. It is available in pints, quarts and gallons.

A First-Aid Kit for Industrial Use

A new type of Brac-Kit, a first-aid kit designed especially for industrial use, has been developed by the Davis Emergency Equipment Co., New York. A special feature is that the kit containing the first-aid supplies is firmly locked, with a dust-proof and water-proof seal, in an outer case, which can be permanently mounted in any convenient location. This permits Brac-Kits to be located at various points in plants, offices, and warehouses, on service trucks and buses, and other places where first-aid may be needed. If an accident happens, no time is lost hunting for first-aid supplies. With a twist of the wrist, the kit is unlocked and withdrawn and its contents are available for instant use. If, after use, the kit is mislaid, its absence will be promptly noted. The kit holds 10 unit-cartons containing dressings and treatments which can be selected to meet any needs. Provision is made for a wire seal to prevent unauthorized removal of supplies.

Magnesite Brick with "Form-Fitting" Steel Case

An improved form of steel-encased magnesite refractory brick, "H-W Improved Metalkase", is now being supplied by the Harbison-Walker Refractories Co., Pittsburgh, for industrial furnace application where operating conditions are unusually severe.

The brick itself is of chemically-bonded magnesite, providing the high refractory qualities and resistance to corrosive basic slags characteristic of this material. After being molded to accurate size under very heavy pressure, each brick is encased on three sides in a "form fitting" jacket of mild steel. As these brick are generally laid as headers, this means that the furnace wall or lining will be built up with each brick completely steel jacketed except at the ends.

At the operating temperatures, the ends of the steel jackets at the heated face oxidize and melt, fusing with the brick itself to form a monolithic surface. However, at a short distance back from the hot face the steel remains intact, adding greatly to the resistance of the wall to spalling influences and to the internal strength of the entire structure.

Recommended applications for the H-W Improved Metalkase brick include walls of basic open-hearth and electric steel furnaces, in which slag line conditions result in unusually severe corrosive action, as well as linings of cement and dolomite kilns, and other high temperature kilns when physical strength and resistance to corrosive basic slags are equally essential.

New Schneible Dewatering Tank

The new Schneible "Rectangular Tank Multi-Louver Dewaterer" is made for use in smaller systems of Multi-Wash Dust Collectors where the quantity of water and sludge produced does not justify the use of the larger capacity truck type dewatering tank, or the still larger concrete rectangular tanks. As its name implies, this unit is rectangular in shape and made for setting directly on the floor or on steel legs as conditions require. The tank is made with a divider down the center separating it into twin tanks for alternate use. At one end is the sludge and water inlet distributor trough just inside and above the sludge discharge gates. At the opposite end are located the weir, skimmer walls, the multi-louvers, and the recirculating and dewatering outlets. The design is simple and fool-proof.

Sludge and water from the multi-wash collector is piped to the dewatering tank and enters at the closed end through the inlet distributor trough which directs it into one of the sections of the tank. The maker claims that as the sludge and water flow into the tank, precipitation of solids immediately takes place. the skimmer wall holding back floating material as the clear water flows over the weir from where it is pumped back for re-use for dust collection.

The low velocity of water in the tank allows for complete precipitation of the solids in the area around the multi-louver vanes. When one of the tanks is sufficiently filled with precipitated material, the inflow water is switched to the other section of the tank by means of the inlet distributor trough allowing for an additional precipitation period. After complete settling, the valve on the line leading to the interior of the loaded tank is opened and the head of water in the tank is allowed to recede slowly. The water flows out of the precipitated material and does not carry the material with it due to the angle of repose of the silica sludge against the multi-louver vanes. The final draining period reduces the moisture contained in the sludge down to approximately 20 per cent or lower. Then the sludge in the dewatered tank is completely drained, the discharge gates are opened and the sludge is pushed out into a convenient receptacle for disposal.

This new rectangular type of dewatering tank provides for easy clean-out by means of the large counterbalanced clean out doors which, when closed, are sealed against water-tight gaskets. The top of the tank is open to allow for ready inspection and measurement of the solids content of the tank in operation. It is manufactured by the Claude B. Schneible Co., Chicago.

Colored Stapling Wire

Stapling wire of almost every imaginable color is now being made to order by Acme Steel Co., Chicago, one of the country's largest producers of wire for stapling purposes. The new product called "Colorstitch" affords an easy and economical means of "dressing-up" corrugated or fibre board shipping cartons. Colorstitch is available in colors that will blend or contrast with plain or printed cartons. It adds the finishing touch of attractiveness.

Acme Colorstitch is made in all standard stapling wire sizes. It has the same rust-resisting qualities as Silverstitch, Acme's widely used galvanized stapling wire. Colorstitch is made in lots of 500 lbs. and more. A sample card showing Colorstitch in standard colors is being distributed by Acme to acquaint users of stapling wire with this new product.

4 hours of Chapmanizing on SAE 1315 Steel.

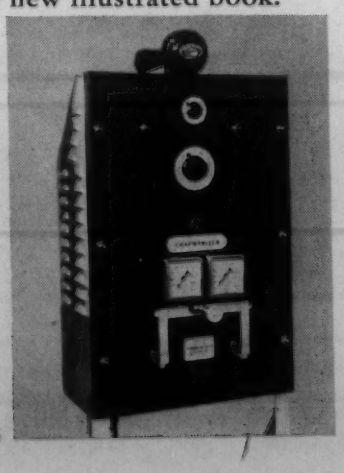
Chapmanizing PROVES ITS CASE TO THE PRODUCTION COMMITTEE

Time and again, this exclusive process of surface-hardening steels has enabled designers and production men to change specifications . . . improve product, cut material costs and overhead for hardening and machining.

For Chapmanizing only takes from 1 to 4 hours to impart a case from .002" to .035" deep. A *tough yet ductile case* that gives free-machining steel the wearability of costly nitrided alloys . . . gives it 9 lives to 1 for carburizing.

Then you can bend, straighten, slide or abrade a Chapmanized part—but it won't crack, flake, warp, distort. *And it resists corrosion.* Parts come from the stabilized bath silvery-clean, free from soft spots.

Find out what Chapmanizing can do for you. Write for new illustrated book.



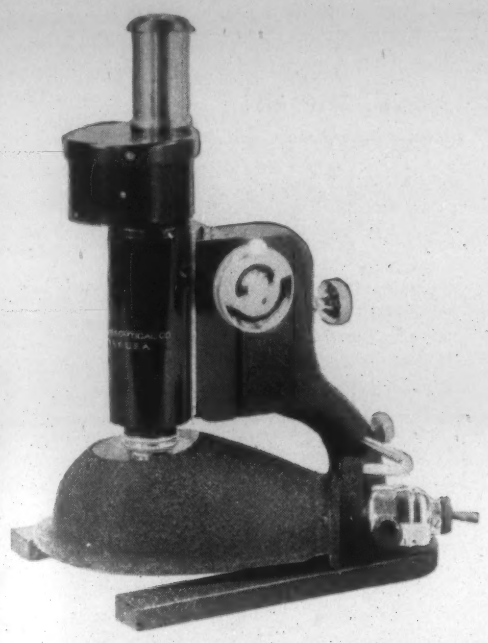
Chapmanizer Unit, installed on contract basis. It's all you need—use it with your present heat-treating equipment.

The CHAPMAN VALVE MANUFACTURING COMPANY

INDIAN ORCHARD, MASSACHUSETTS

A Shop Microscope

A small microscope for the detailed examination of casting defects, foundry sands and machined parts has been perfected by the Harry W. Dietert Co., Detroit. Its net weight is 5 lbs. and its height 10 in. Its magnification is 30X as standard and, when specified, 20X or 40X can be supplied.



The shop microscope is a sturdy constructed Bausch-Lomb microscope with a built-in illuminator. Standard equipment consists of 32 mm. achromatic objective and 7.5X Huygenian eyepiece. 5X and 10X eyepieces are also available. The shop microscope is equipped with an erecting prism so that the object viewed is seen in erect position.

It is a practical tool for both the technical and practical man to examine inclusions or surface casting defects in detail. The shop microscope works equally well on small samples or large castings in the shop. It will work in any position, is easy to focus and surface need not be furnished or polished.

Protective Coatings

"Mayco Protective Coatings", containing chlorinated rubber and acid and alkali-resistant placticizers, are now offered for the effective protection of plant and equipment against corrosion. Various types are available which are claimed to be moisture, acid and alkali-proof. Practical long range tests have proven the value of these coatings in the effective protection of metal, wood and concrete surfaces against corrosion attacks of acid and alkali vapors and liquids. These products are furnished by the May Products, Inc., Newark, N. J.

A Round-Chart Potentiometer Pyrometer Controller

A new round-chart pyrometer controller has been developed by The Bristol Co., Waterbury, Conn., known as "Bristol's Pyromaster Controller." This instrument is a potentiometer pyrometer, operating on a greatly simplified principle and is available in both pneumatic and electric types. It uses standard thermocouples and extension leads, and is for direct ink-marking on a round 12-in. chart, or for indicating on a large scale.

Bristol's Pyromaster Controllers require no lubrication; they are not affected by plant vibration; there is no mechanical motion of any kind, except when a change in the measured temperature takes place. The extreme simplicity of the operating principle used makes it possible to place the entire mechanism in a standard Bristol's instrument case.

These potentiometer pyrometer controllers are automatically self-balanced and self-compensating for cold-end temperature changes. The pen-arm or indicator is actuated in small steps that follow each other at a rate depending upon the rate of change in the temperature at the thermocouple. All lag is thus eliminated, permitting immediate response to changes exactly as they occur. Bristol's Pyromaster is available as: (1) A recorder; (2) A recorder with indicating scale; (3) A recorder controller; (4) A recorder controller with indicating scale.

A Versatile Wrinkle Finish for Metals

The Sherwin-Williams Co., Cleveland, offers a remarkably beautiful and distinctive wrinkle finish that is extremely versatile from the standpoint of effects produced and applicability to various metal surfaces and product types. Finishes of this type were put on the market a few years ago and have been used successfully on various products made of steel, black iron, cast iron, galvanized iron, aluminum, etc., but the use of this finish on smaller items such as clocks, cameras, appliances and the like have been done in only a limited way because many manufacturers are still unaware that this finish can be so handled as to produce a very fine, miniature wrinkle suitable for instrument cases and other similar items; or controlled to give the degree of coarseness desired on larger surfaces.

This art metal wrinkle finish offers many distinct advantages in that it produces a full, rich finish in but a single coat and requires no undercoater. It has the ability to hide any minor surface imperfections resulting from fabrication, or casting, and thus saves the cost of exacting polishing operations. The finish also adapts itself excellently to automatic spraying set-ups and may be baked in either direct or indirect gas, steam, or electric ovens. Longer baking increases its hardness without sacrificing flexibility. The uniform wrinkling even on corners and beading is the result of proper balance in formulation, even spraying of the finish, plus careful control of baking temperatures throughout the oven.

A Soluble Cutting Oil

A new soluble cutting oil for use with high speed machine tools operating under heavy feeds has been developed by the industrial division of the National Oil Products Co., of Harrison, N. J.

Named "NOPCO 1227-B", this oil cools as well as lubricates under the tremendous heat generated by machine tools in operation. It is used in turning, grinding, milling, drilling, light broaching and other metal working conditions. NOPCO 1227-B is a combination of mineral and fatty oils treated in such a way as to be immediately soluble in cold or warm water. The fatty oil content is high compared with most soluble mineral oils.

DOES *High Speed production* GIVE YOU A PROFIT?

In your shop right now perhaps there is a cutting job that you would like to do at a profit—It may be a tough alloy or a heat-treated steel or some other material on which ordinary high speed steels fail, especially at high speeds.

Circle C Super High Speed Tool Holder Bits are famous for their ability to machine materials considered unmachinable with regular high speed steel—But that is not the only value, on your every day production, you can use them to effect substantial savings by speeding up your machining operations. Circle C Bits have a tool life many times greater than that of ordinary high speed steel.

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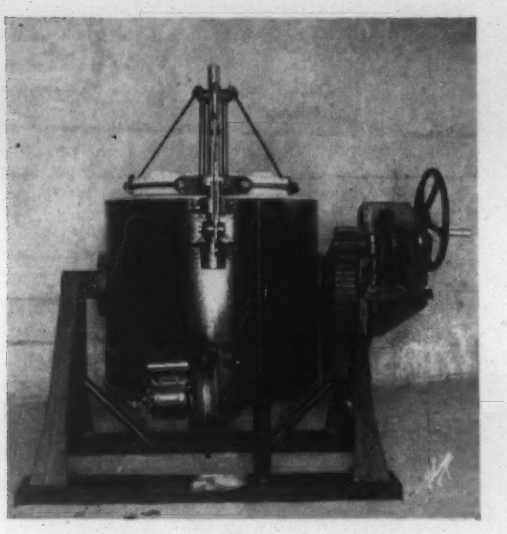
The Walker-York Melting Furnace

The Crucible Furnace Co., Inc., Charlottesville, Va., is the maker of the Walker-York melting furnace for which certain claims are made. The principle involved in its operation is identical with the cupola save for the fact that the metal is melted in a crucible and therefore is protected from the loss of good elements as well as from the addition of bad ones. In this furnace economy of coke plus intense heat is said to be obtained, the heat being developed in the lower part due to complete combustion in the primary zone.

The furnace is lined in the bottom zone with special shapes of "Anchor" brand Harbison-Walker refractories which have a melting temperature above 3150 deg. F. This special lining extends for 13 in. The balance of the furnace is lined with the "Alamo" brand of Harbison-Walker refractories which withstand a temperature in excess of 2900 deg. The top is made of the Anchor brand withstanding temperatures of 3150 deg. Back of the refractories there are 2 in. of Harbison-Walker's "HW-111" insulating brick and back of these brick 2 in. of "HW Calag." With this insulation, even though the furnace develops 3400 deg. temperature in the melting zone, the shell temperature does not exceed 450 deg.



The unit is absolutely self-contained and requires no additional equipment of any kind. It can be furnished either stationary or on wheels. All furnaces are equipped with General Electric capacitor type 40-deg. motors.

The furnace is reported to have been successfully used in the melting of alloy cast iron, nickel, nickel silver, the rich metal bronzes and alloy crucible steel. In general foundry work it can be used in all metals with a melting point of 3100 deg. or less. It is made in three sizes—21 in. inside diameter accommodating crucibles up to No. 60, stationary type only; 24 in. diameter in the stationary accommodating crucibles up to No. 150, and in the tilting type taking a special crucible with a rated capacity of 500 lbs. of metal; the 30 in. diameter, tilting type only, accommodating special crucibles with rated capacities of 750 and 1250 lbs.

High Temperature Bonding Mortar Improved

Further improvement has recently been made in the refractoriness and working quality of "Harwaco Bond," a high temperature bonding mortar recommended for use in industrial furnace masonry. The improved product has a pyrometric cone equivalent of Cone 32 (3092 deg. F.). Use of this diaspore-base bonding mortar in place of mortar consisting essentially of fire clay is becoming increasingly general for laying fireclay, super-duty fireclay, and high-alumina brick where a strong bond must be maintained at the upper limits of industrial furnace operating temperatures. It remains uniformly soft and plastic throughout the steel drum or container in which it is shipped. The improvement in the product is the result of several years of research by the Harbison-Walker Refractories Co., Pittsburgh.

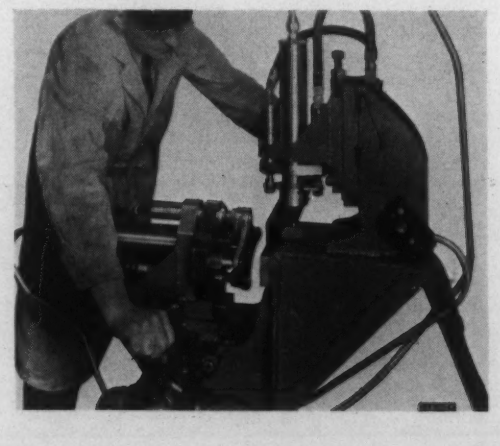
Electromet Special Graphitizer Announced

A new graphitizing compound, "Electromet Special Graphitizer", has been developed by Electro Metallurgical Co., 30 East 42nd St., New York, for use in the cast iron foundries to help produce castings of greater uniformity and improved machinability. This inexpensive compound acts as both a deoxidizer and graphitizer, and is particularly useful in controlling the tendency of castings to chill in light sections and at corners.

Usually the addition of as little as 2 to 8 oz. of Special Graphitizer to each 100 lbs. of cast iron will reduce the depth of chill, soften light sections, and improve their machinability. Such additions refine the graphite in heavy sections and thus improve the strength and uniformity of the iron. Electromet Special Graphitizer improves fluidity, but does not appreciably change the composition of the iron. It promotes the formation of normal flake graphite and tends to eliminate "eutectic" graphite areas. It is convenient and easy to use, and is of particular value when only a hard base metal is available, or when uncontrollable changes in the operation of the cupola would cause excessive chilling.

Progressive Hydraulic Self-Stripping Punching Unit

A new self-stripping hydraulic punching unit has been developed by the Progressive Welder Co., 737 Piquette Ave., Detroit, for production fixture punching on sheet metal parts. The individual punching units eliminate expensive cam dies and can be positioned to accommodate curved or irregular shaped parts. Each unit can punch one or a group of holes according to its size in one movement and will accommodate to No. 11 gage sheet. The hydraulic stripper positions the work against the die before and releases it only after the punching cycle is completed. This stripper prevents material distortion and insures clean accurate burrless holes. The punching units can be mounted in groups in fixtures and are easily changed to accommodate variations or revisions. The units are connected to a master control valve which, with a single movement, starts the punching operation.

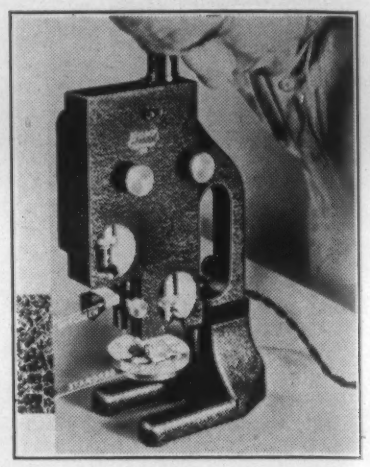


In fixtures for large irregular shaped parts, clamping devices for holding the work are used. Hydraulic pressure is supplied by electrically driven hydraulic pumps maintaining the necessary constant pressure to the units. A large reservoir supplies fluid for the system and will accommodate any number of punches. Naturally any shaped holes can be pierced; and the units are fitted to accommodate standard interchangeable punches and dies. All punching operations can be combined in one fixture taking the work directly from the press and eliminating individual punching operations and expensive dies. Safer operation is insured as hydraulic operation eliminates dangerous moving mechanisms. The combining of several operations in one fixture saves valuable floor space, material handling and operating personnel.

A Comparison Microscope

For a quick, low-cost way to examine and compare the grain structure of metals, the George Scherr Co., 128 Lafayette St., New York, has put on the market the "Busch Comparison Microscope" for shop and laboratory. It is described as a simple, efficient instrument for checking by direct visual comparison, the grain structure of metals used in regular production against established standards, thereby assuring maintenance of desired metallurgical characteristics without the need of photomicrographs.

By the use of proper standards the following properties of metals and alloys may be estimated, usually to the same degree of accuracy that can be obtained by other standard methods.



1. Estimation of grain size or other particle size.
   Example: Grain size of annealed alpha brass.
2. Estimation of amount of various phases of an alloy.
   Example: Estimation of percentage of beta in an alpha-beta brass.
3. Estimation of amounts of various insoluble constituents in a metal.
   Example: Lead in brass.
4. Estimation of amounts of insoluble impurities in a metal.
   Example: Sulfides in steels.
5. Estimation of degree of cold work and approximate hardness in a metal which is in the cold worked condition.
   Example: Cold drawn wire.
6. Estimation of thickness of films and layers.
   Example: Thickness of tin or chromium plate.
7. Estimation of size of voids in sintered alloys and in refractories.

A few of the many other uses claimed for this microscope are:

Examining and comparing machined surfaces for quality of finish and for machining marks, hardening cracks, fractures and other flaws.

Examining and comparing paper and textile structures.

Comparative examination of documents, banknotes, signatures, criminal evidence, etc.

Its use for these purposes is explained in a separate bulletin, copy of which will be mailed on request.

New Lacquer Is Burn-Proof

"Durtemp", a new baking lacquer developed by Maas & Waldstein Co., makers of industrial finishes, Newark, N. J., withstands the action of match flames, lighted cigars and cigarettes, and perfumes, alcohol, and household chemicals. Durtemp is a gold colored clear lacquer, which is applied to metals by dipping or spraying and is then baked. It is being used for finishing ash trays, but is also useful for serving trays, vanity cases, and other products requiring protection from lighted cigarettes, spilled perfumes, and other things that are injurious to ordinary finishes.

Hoffman "Flexbox" for Heat Treating

The American Manganese Steel Co., Chicago Heights, Ill., is introducing the Hoffman "Flexbox" (patent applied for) for use in carburizing, annealing and other heat treatment processes. Greater operating efficiency is claimed for it as the outcome of recent tests in production carburizing.

The "Flexbox" is made in six separate parts of heat and abrasion resistant AMSCO Alloy. The corrugated sides are tongued to fit into

grooves in the corrugated ends and may be keyed in place. The frame thus formed nests on a flanged bottom plate with legs for batch type furnaces and has a flanged cover which fits over the box. A special type of Flexbox is made with the bottom plate fitting and plates for use where the contents must be lifted with the box.

It is claimed that Flexbox does away with the distortion or cracking commonplace in furnace boxes of solid cast or welded construction, brought about by alternate heating and cooling. Sufficient clearance is provided between tongue and groove to absorb expansion from heating of the parts and to allow contraction in cooling. With this new design, however, there is no appreciable gas leakage at the joints. Flexboxes are lighter than ordinary boxes, therefore easier to handle. Should a section of the box fail, it can be easily and quickly replaced at a fraction of the cost of an entire box.

Small Tilting Crucible Furnace

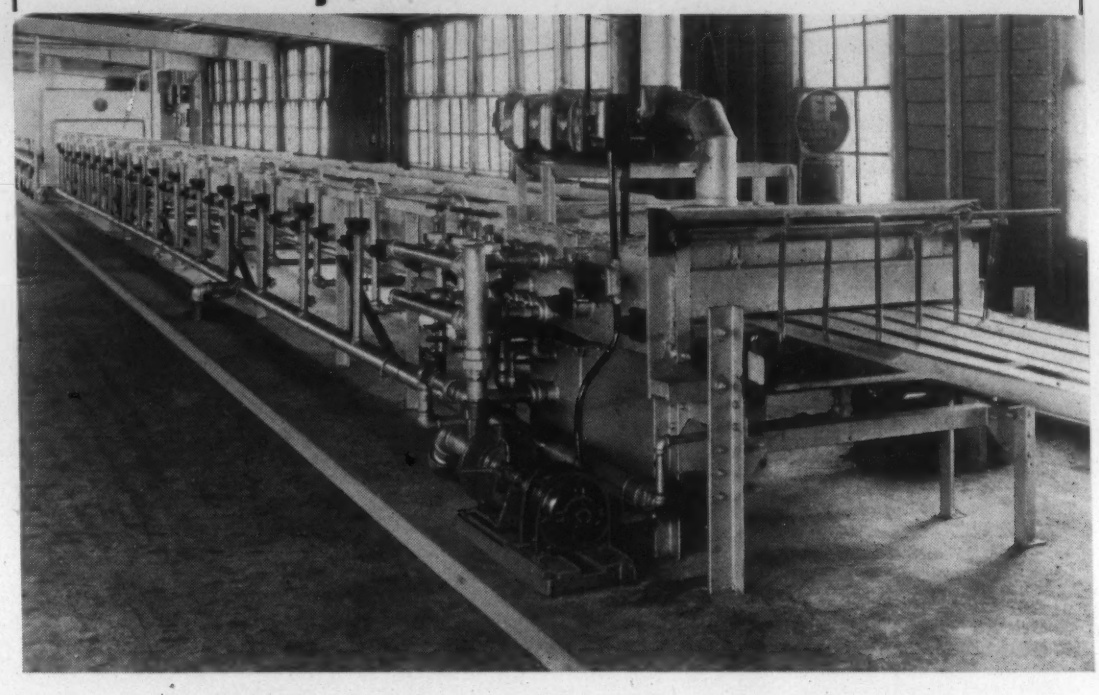
The Campbell-Hausfeld Co., 200 Moore St., Harrison, Ohio, manufacturers of gas and oil-fired melting furnaces, has designed a small tilting crucible furnace for non-ferrous melting. It is built to accommodate a No. 60 or No. 80 standard long lip crucible. Capacity 180 lbs. or 240 lbs. per heat. When using a No. 60 crucible, a heat can be taken from this furnace every 30 min. This reduces the time required by a stationary pit type furnace of the same capacity, approximately ¼ hr. on each heat. With the stationary pit type furnace the cover swings clear of the furnace and after each heat the crucibles are removed. The result is a temperature loss and waste of fuel. With the small tilting type furnace, cover remains on the furnace, conserving the temperature that has been built up with the result of lower fuel costs and faster melting.

Transferring Corrosive Liquid

The Lea Mfg. Co., Waterbury, Conn., is marketing a bulb type pump for drawing acids and other corrosive liquids from carboys and similar containers. The tubing used is glass which is resistant to ammonia and all acids with the exception of hydrofluoric and will not contaminate C.P. and reagent grade chemicals. This type of pneumatic pump operates faster than a syphon as it applies proper pressure to the surface of the liquid. Normal capacity is about 2 gals. per min. but higher capacities are obtainable by a more rapid manipulation of the bulb. A release valve can be opened to vent the unused pressure.

INSULATED FOR

added efficiency and economy with Armstrong's Brick



The Electric Furnace Company of Salem, Ohio Used Armstrong's* A-25, N-16, *and* EF-22 *Insulating Fire Brick in This Modern Annealing Furnace

ABOVE is shown the discharge end of a continuous controlled atmosphere furnace for bright annealing cold rolled steel. It was insulated with Armstrong's A-25, N-16, and EF-22 Insulating Fire Brick for the following important reasons:

1. Greater heating saving.
2. Thinner furnace walls and consequent larger hearth area.
3. More uniform heat distribution.
4. Easier and more flexible temperature control.
5. Quicker heating and cooling of the furnace.
6. Increased production.

Armstrong's Line of Insulating Fire Brick includes five types to meet a variety of needs. They are equally serviceable for electrically heated or coal or gas fired equipment. If you need special shapes, Armstrong can supply them either machined or molded to size. And Armstrong's qualified high temperature insulation engineers are at your service, without charge or obligation, to help you select proper materials for your particular needs.

It will pay you to get the complete story on Armstrong's High Temperature Products. For samples and descriptive literature, write Armstrong Cork Products Company, Building Materials Division, 982 Concord St., Lancaster, Pa.

Armstrong's

HIGH TEMPERATURE INSULATION

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